Agilent E6474A

Wireless Network Optimization Platform

User's Guide

:·'·:· **Agilent Technologies**

Notices

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WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Welcome to Agilent E6474A Wireless Network Optimization Platform

Thank you for choosing Agilent Technologies. In this User's Guide, you will find the instructions you need to setup the hardware and begin using the software to take measurements.

Agilent E6474A is a state-of-the-art network testing tool that provides you with a number of features that make it unique in the family of RF engineering tools.

The Agilent E6474A Wireless Network Optimization Platform enables wireless service providers and network equipment manufacturers to proactively address challenges with wireless voice and data networks by quickly and accurately identifying problems. This makes troubleshooting complex networks faster and more efficient than before.

The E6474A provides you with a wireless network test solution that can be leveraged to enable site evaluation, base-station turn-on, system acceptance, and on-going optimization. Whether determining quality of service from the customer perspective, or performing comprehensive network management, the E6474A offers a common solution to meet these requirements.

The E6474A grows with your needs to provide industry-leading performance during all phases of the network lifecycle. Being a highly-scalable, modular platform, the functionality of the E6474A can be increased as needed. If you decide to enhance your current network, or migrate to a different technology, the E6474A can be leveraged to that the tools and training investments are minimized as new technologies and data formats are evaluated and turned-on.

Information you need

This guide is one member of the fresh, newly-designed documentation set for the Agilent E6474A. It is designed to provide you with a smooth, successful installation and set-up. In addition to this guide, the documentation set includes:

- **E6474A Quick Basics**—online tutorial that provides interactive training on how to use the system.

- **Getting Started Poster**—helps you quickly set up the hardware. You'll find that the steps on the poster correspond directly to the chapters in this book, making it easy to know where to go for more information.

- **Online help**—provides context-sensitive information for entries in each of the views within the software, as well as in-depth information about the use of the E6474A software.

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Agilent E6474A
User's Guide

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Get Ready

What You'll Find in this Chapter

To do this	See this
Read about this guide, including a summary of each chapter and appendices' contents	"About This Guide" on page 13
Read about the E6474A software features	"The E6474A Software" on page 16
Review computer requirements	"Computer Hardware and Software Requirements" on page 15

About This Guide

This guide contains installation and operating instructions for the Agilent E6474A Wireless Network Optimization Platform software, as well as instructions for using the Agilent E6473B High Speed Direct Connect Hub.

See this chapter	For this information
1 Get Ready	An overview of the Agilent E6474A and E6473B Computer software and hardware requirements
2 Install the Software	Instructions for Installing the E6474A and E6473B USB software
3 Set Up Your System	Setup instructions and cable connections for in-vehicle (drive test) and portable systems
4 Use Your System	• Powering up indoor and in-vehicle systems • Starting the software • Verifying the system

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5 Get Results Fast	• Using the Quick Basics to get started learning to use the E6474A • Accessing and using online help
6 Get Assistance, If You Need It	• Getting telephone support • Frequently asked questions • Returning systems for service • Solving problems • Contacting customer support • Updating E645xx receiver firmware
Appendix A Safety and Regulatory Information	Information to help you to use your system safely
Appendix B GPS Connections for E74xx Systems	For users of legacy E74xx Drive Test Solutions. It contains cabling information for existing systems with the GPS options listed.
Appendix C Connection Panels and Indicator LEDs	A quick reference for the panel connectors and LED indicators of the E6473B High Speed Direct Connect Hub, E645xx receiver, E746xx scanner, the GPS/DR Navigation unit, and the Trimble Placer 455DR
Appendix D System Information	System specifications, including software and hardware options, and part numbers
Appendix E Permanent In-Vehicle Hardware Installation	Instructions for installing those components that are connected to your vehicle, such as base plates and cables
Index	Key word index helps you find information quickly

Computer Hardware and Software Requirements

The following are the recommended computer requirements:

- 400 MHz Pentium processor or higher
- 128 Megabytes of RAM or higher
- 1 USB port (for systems equipped with the E6473B High Speed Direct Connect hub)
- 1 serial port per test mobile (for a phone connected directly to a serial port)
- 1 parallel port (for the software license key, if the computer is not equipped with a USB port or if the USB port is being used for the E6474A Direct Connect hub)
- 2 PCMCIA slots
- 1 Gigabyte hard drive or higher
- 800 x 600 display resolution (or 1024 x 768 for generic data measurements)

Item	Information/Requirements
E6474A software	Compatible with Windows 95 (for direct connect phones only), 98, 2000, and ME. Persons using this software should be familiar with the Windows user interface. These recommendations are subject to change as new functionality is provided in the product.
Dual serial port PCMCIA (Socket I/O) card	Required for a system equipped with multiple phones, each of which is connected to a computer serial port. The Socket I/O card is included with the phone, and combination phone and receiver/scanner software licenses.
E6473B High Speed Direct Connect Hub	Enables communication with the software via the computer's USB port. Two phones, a DTI scanner or up to two Agilent receivers, and a GPS navigator can be connected to the Direct Connect Hub. The Direct Connect Hub eliminates the need for the Socket I/O cards.

The E6474A Software

The Agilent E6474A Wireless Network Optimization software allows you to collect engineering parameters, perform coverage and quality of service tests, and do fault detection on wireless networks. Collected data is displayed in real time, and can be played back during or after a test. The software has a user-friendly interface that allows you to create multiple test plans with different logging options and data views.

You can export data files in .csv, .mif, .qlc, and .txt formats. In Live Mode, you can display measurements without creating a data file.

All measurements can be geodetically referenced, using either the optional in-building or in-vehicle navigation information. Up to three parameter measurements can be plotted on-screen in the Route Map view, along with event markers and user notes.

Using in-building navigation, you track your position on a bitmap of a floor plan that is displayed on-screen, or by recording the number of paces and your direction changes from a starting point. Using in-vehicle navigation, your position is automatically tracked within the Route map view.

See Appendix D, "System Information", on page 179, for a list of supported devices. The E6474A software is compatible with the following configurations:

- E6473B High Speed Direct Connect Hub and accessories
- Devices connected to a computer serial port
- E74xx indoor and drive-test solutions

Key Software Features

The following features are available, depending on the software license options you purchase.

- Obtains RF coverage and service performance measurements for 2G, 2.5G, and 3G network optimization
- Controls up to four receivers and four phones simultaneously
- User selection of the data parameters and messages collected

- A full set of standard views for displaying parameters graphically or as text
- Simultaneous display of multiple views to allow network comparisons
- Automatic dialing to repeatedly place calls during a test, with user-defined parameters
- Carrier vs. interferer measurements, displayed graphically
- User-defined list of channels to scan for signal strength and channel identifier
- Call statistics, categorized by call termination result
- Alarms, triggered by user-defined parameters and limits
- User-configurable chart for graphically plotting parameters over time
- Data files that are time-stamped and geodetically referenced (with real time mapping or indoor measurement capability options)
- Spectrum analysis, CW/channel power, and pilot analyzer, for Agilent CDMA receivers
- Spectrum analysis and code domain power views for CDMA and cdma2000 base station testing
- Spectrum analysis, broadcast channel analysis, and interference analysis views for Agilent GSM receivers
- Spectrum analysis, broadcast channel analysis, and interference analysis views for Agilent UMTS receivers
- Spectrum analysis, CW/channel power, channel analysis, and interference analysis for Agilent TDMA receivers
- cdma2000 code domain power, code domain power (IS-95 only) and base station spectrum analysis for cdmaOne and cdma2000 over-the-air base station testing
- Supports TDMA, IS-95, GSM, GPRS, GAIT, IS-2000, iDEN, and UMTS technologies on a single platform
- Generic data testing and measurement capability

NOTE   TechTool measurement licenses (E64XXA) do not include data recording, Layer 3 messages, or user-configured alarms.

License Manager

Introduction

Software options are enabled via software license keys (also called "Dongles") that are attached to either the USB or serial port on your computer. The DB25 software license key included with the E6474A software contains the licenses for the software options you have purchased. When started, the E6474A software queries the key to determine which options to enable.

License Manager software is automatically installed when you install the E6474A software. This software allows you to:
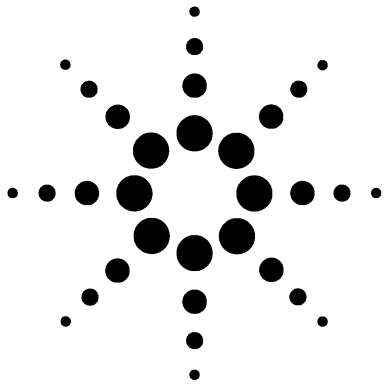
- Transfer licenses between keys included (for example, from the DB25 key to the USB key)
- Add software options to your license key
- Transfer licenses between keys on different computer systems
- Transfer licensed product options between license keys
- View online help on the use of License Manager features

For More Information

For complete instructions on using the License Manager, please refer to the Welcome topic in the License Manager software's online help.

1 To start the License Manager, click **Start > Programs > Agilent Wireless Solutions > Utilities > License Manager**.

2 Click **Help > Contents** to open the Welcome topic.

1 Get Ready

2

Install the Software

What You'll Find in this Chapter

To do this	See this
Install the E6473B USB software. **Note:** If your system's devices are connected to the serial ports of the computer, please skip "Installing the USB Drivers, and proceed to "Installing the Agilent E6474A Software" on page 23.	"Installing the USB Drivers" on page 22
Install the Agilent E6474A software	"Installing the Agilent E6474A Software" on page 23
Complete the installation	"Preparing to Collect Data" on page 25

Installing the USB Drivers

In order for your computer to communicate with the connected devices, the appropriate drivers must be installed for your computer's operating system.

Complete instructions on installing USB drivers are available in *Important Information About the E6473B Agilent High Speed Direct Connect Hub.* This document is shipped with the E6473B system, and the latest version is also available at http://www.agilent.com/cm/wireless/e6474/download.shtml.

NOTE	**Windows 2000** Windows 2000 requires that anyone installing hardware drivers must have System Administrator rights. If you do not currently have System Administrator rights for the computer on which the E6473B drivers need to be installed, contact your site's IT Support for assistance. They can either grant you the rights you need to install the drivers, or they can log onto your computer and perform the installation for you.

Installing the Agilent E6474A Software

Uninstalling Existing Software

If you are uninstalling existing E6474A, Walkabout, or VoicePrint software, follow these steps in the order they are presented:

1 From the Start menu, choose **Settings > Control Panel**, and then double-click **Add/Remove Programs**.

2 Select Agilent E6474A, then click **Add/Remove**, then click **Yes** to start the uninstall process.

3 After the uninstall is complete, shut down, then restart the computer. You can then install the new version of E6474A software, as described below.

Installing New Software

The installation CD-ROM contains three separate applications: E6474A software, License Manager, and Cellsite Editor. All applications are automatically installed when you install E6474A.

1 If present, remove the software license key from the parallel or USB port of the computer.

2 Power up the computer.

3 Close any applications that are running.

4 Disable any anti-virus software that is running.

5 Insert the installation CD into the CD-ROM drive. Depending on your computer, the installation process may start automatically. However, if it does not, do the following:

- Open Windows Explorer, select the CD-ROM drive, and then open the INSTALL folder.
- Double-click SETUP.EXE to start the installation.
- Click **Yes** in the Question dialog box to proceed with the installation.

6 Follow the instructions in the installation wizard. It is recommended that you accept the defaults offered for the destination directory and the program folder.

Completing the Installation

1 After the installation is complete, an Information dialog box appears, indicating that the installation was successful. Click **OK**.

2 When the Setup Complete dialog box appears, choose **Yes, I want to restart my computer now**, then click **Finish**. The computer restarts.

3 When the computer is ready, open the Start menu and go to Programs > Agilent Wireless Solutions > E6474A > Release Notes.

4 Read the Release Notes to learn what's new in the software.

Preparing to Collect Data

Insert the Software License Key

The E6474A installation packet contains a hardware device programmed with the options you have purchased. Before starting the E6474A software, plug the device into your computer's parallel port. The license key must be inserted for data collection and monitoring. You can transfer the license information to the USB-style key (also included) using the License Manager software. See "License Manager" on page 19.

Create a Data Folder

Create a data folder for storing the data files you collect. Data files have an ".sd5" extension. When you begin a test, a dialog box prompts you for a file name and a location in which to store the data file, if you have disabled the automatic file naming option.

Copy the Map Files

For in-building navigation, a bitmap image of the floor plan is typically used. If you plan to use in-building navigation, or to display your route onscreen with data from an in-vehicle navigator, it is recommended that you create a Maps folder within the application's directory structure. Then copy the maps you plan to use into it. The supported map file formats include: .bmp (bitmap), .map (ETAK street map), and .mif (MapInfo).

Copy or Create a Cell Site Database

This step is optional. A cell site database enables the software to display cell site names in certain views. If you do not have a cell site database (a file with a ".cd2" extension), you can create one using the Cellsite Editor software. Cellsite Editor is included on the installation CD. Refer to the Cellsite Editor software's online help for procedures.

2   Install the Software
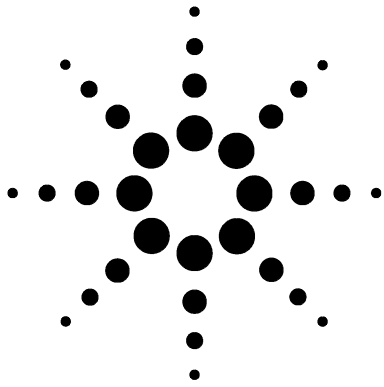
3
Set Up Your System

What You'll Find in this Chapter

Below you'll find two tables to help you quickly locate the set up information you want, one for in-vehicle systems and the other for portable systems.

NOTE	If you need to permanently install hardware components, such as a Direct Connect Hub base plate, refer to "Direct Connect Hub Installation" on page 210.

In-vehicle Systems Set Up - Quick Reference

In-Vehicle System Component(s)	To setup hardware, see:	To connect cables, see:
Direct connect hub with scanner	"Mounting the Hub" on page 35	"Direct Connect Hub with Scanner" on page 38 "E6473B High Speed Direct Connect Hub Connections" on page 38 "E746xx Scanner Connections" on page 40 "Computer Connections" on page 41 "Garmin GPS Receiver Connections" on page 41
Direct connect hub with scanner and GPS/DR Navigator	"Mounting the Hub and Scanner or Receiver" on page 35	"Direct Connect Hub with Scanner and Agilent Direct Connect GPS/DR" on page 42 "E6473B High Speed Direct Connect Hub Connections" on page 38 "E746xx Scanner Connections" on page 40 "Communicating with the Agilent Direct Connect GPS/DR" on page 45 "Computer Connections" on page 41

In-Vehicle System Component(s)	To setup hardware, see:	To connect cables, see:
Direct connect hub with receiver(s)	"Mounting the Hub and Scanner or Receiver" on page 35	"Direct Connect Hub with Receivers" on page 45 "E6473B High Speed Direct Connect Hub Connections" on page 38 "Single E645xx Receiver Connections" on page 47 "Second E645xx Receiver Connections" on page 48 "Computer Connections" on page 41
Direct connect hub with receiver and GPS/DR Navigator	"Mounting the Hub and Scanner or Receiver" on page 35	"Direct Connect Hub with Receivers and Agilent Direct Connect GPS/DR" on page 50 "E6473B High Speed Direct Connect Hub Connections" on page 38 "Single E645xx Receiver Connections" on page 47 "Second E645xx Receiver Connections" on page 48 "Communicating with the Agilent Direct Connect GPS/DR" on page 45 "Computer Connections" on page 41
Direct connect hub with phone	"E6473B High Speed Direct Connect Hub Connections" on page 38	"E6473B High Speed Direct Connect Hub Connections" on page 38
Computer serial port to phone	"Computer Serial Port Connections" on page 57	"Computer Serial Port Connections" on page 57
Two direct connect hubs	"Connecting Two Direct Connect Hub-Systems" on page 55	
Pulse trigger device	"Pulse Trigger Device" on page 58	
External antenna		"External Antennas" on page 58

Portable Systems Set Up Quick Reference

Portable System Component(s)	To setup hardware, see:	To connect cables, see:
Single scanner	″Phone Only" on page 31 ″Chassis Assembly" on page 61 ″Carry Pack Final Assembly" on page 65 ″Using Carry Pack Assembly with the Shoulder Strap" on page 66 ″Using the Carry Pack as a Backpack" on page 66	″E6473B High Speed Direct Connect Hub and E746xx Scanner Connections" on page 64 ″E746xx Scanner Antenna Connections" on page 65
Direct connect hub and phone	″Phone Only" on page 31 ″Chassis Assembly" on page 61 ″Carry Pack Final Assembly" on page 65 ″Using Carry Pack Assembly with the Shoulder Strap" on page 66 ″Using the Carry Pack as a Backpack" on page 66	″E6473B High Speed Direct Connect Hub Connections" on page 70
Direct connect hub and scanner	″Phone Only" on page 31 ″Chassis Assembly" on page 61 ″Carry Pack Final Assembly" on page 65 ″Using Carry Pack Assembly with the Shoulder Strap" on page 66 ″Using the Carry Pack as a Backpack" on page 66	″E746xx Scanner Antenna Connections" on page 65
Direct connect hub and receiver	″Portable Single E645xx Receiver System" on page 68 ″Chassis and Backpack Assembly" on page 69 ″Final Assembly" on page 72 ″Using the Single-Receiver Backpack" on page 73	″E6473B High Speed Direct Connect Hub Connections" on page 70 ″E645xx Receiver Connections" on page 71

Portable System Component(s)	To setup hardware, see:	To connect cables, see:
Direct connect hub and two receivers	"Portable Dual E645xx Receiver System" on page 73 "Direct Connect Hub Chassis Assembly" on page 74 "Receiver and Hub Mounting" on page 77 "Dual Receiver Backpack Final Assembly" on page 79 "Adjusting the Backpack Harness" on page 81	"Cable Routing Within the Backpack" on page 76 "Cable Routing Through the Shoulder Straps" on page 76 "Cable Connections to the E6473B High Speed Direct Connect Hub" on page 78 "Cable Connections to the E645xx Receiver" on page 78
Computer serial port and phone	"Computer Serial Port Connection" on page 82	"Computer Serial Port Connection" on page 82
Carry pack with shoulder strap (for scanner)	"Using Carry Pack Assembly with the Shoulder Strap" on page 66	"Carry Pack Final Assembly" on page 65
Carry pack as backpack (for scanner)	"Using the Carry Pack as a Backpack" on page 66	"Carry Pack Final Assembly" on page 65
Single-receiver backpack	"Portable Single E645xx Receiver System" on page 68 "Chassis and Backpack Assembly" on page 69 "Adjusting the Backpack Harness" on page 81	"E6473B High Speed Direct Connect Hub Connections" on page 70 "E645xx Receiver Connections" on page 71 "Final Assembly" on page 72 "Using the Single-Receiver Backpack" on page 73
Two-receiver backpack	"Portable Dual E645xx Receiver System" on page 73 "Direct Connect Hub Chassis Assembly" on page 74 "Receiver and Hub Mounting" on page 77 "Adjusting the Backpack Harness" on page 81	"Cable Routing Within the Backpack" on page 76 "Cable Routing Through the Shoulder Straps" on page 76 "Cable Connections to the E6473B High Speed Direct Connect Hub" on page 78 "Cable Connections to the E645xx Receiver" on page 78
Vehicle usage of a portable system	"Using Portable Components in a Vehicle" on page 83	

In-Vehicle System Set Up

Software License Key

A DB25 software license key determines which software options are enabled. Connect it to the parallel port of the computer. You can transfer the license information from it to the USB key using the License Manager software that is included with the E6474A or E74xx software. Refer to the License Manager's online help for instructions.

Devices Connected Directly to a Computer

This section only applies to systems consisting of a computer and a device (or devices) connected directly to the computer's serial port(s). Devices that can be connected directly to the computer include phones, Agilent 64xx receivers, and GPS navigators.

If your system includes an E6473B High Speed Direct Connect Hub or other E6473B options, please refer to "Devices Connected Through an E6473B High Speed Direct Connect Hub" on page 33.

<table>
<tr><td>**NOTE**</td><td>For all direct connect systems, the software license key must be connected to the computer while you are using the E6474A software. The DB25 key is programmed with the licenses that you have purchased, and is to be connected to the computer's parallel port. If you plan to use the USB key instead, it must be programmed using the License Manager software before use.</td></tr>
</table>

Single-Device Portable System

Phone Only

1 Connect the phone to its interface cable.

2 If necessary, connect the phone interface cable to the 9-to-26 pin adapter. (Non-TDMA phones can be directly connected to

the serial port without an adapter when an OEM cable is used.)

3 Connect the 9-to-26 pin adapter to the serial port of the computer.

E64xx Receiver Only

1 Connect the receiver's interface cable to the RS-232 port of the receiver. Connect the opposite end of the cable to the serial port of the computer.

2 Connect the power cable to the 9-34 VDC socket of the receiver. Connect the opposite end of the cable to the battery.

3 If equipped, connect the GPS antenna to the GPS ANTENNA connector.

Two-Phone Portable System

Dual Serial Port PCMCIA Card

If your system includes multiple devices but does not include an E6473B High Speed Direct Connect Hub, at least one dual serial port PCMCIA card is required. Two devices may be connected to each card. The Dual Serial Port PCMCIA card is required for the following system configurations:

• A system with two or more phones that does not include an E6473B High Speed Direct Connect Hub. In this case, connect each phone to a Serial port of the card.

• A system equipped with one Direct Connect Hub that has more than three phones. (The Direct Connect Hub has two Phone ports, and your computer may have a Serial port that can be utilized.) In this case, connect each additional phone to a Serial port of the card.

• A system with one phone collecting both data and trace measurements that does not include the E6473B high speed direct connect hub.

Refer to the manufacturer's instructions if you need to install the Dual Serial Port PCMCIA card:

- Your Dual Serial Port PCMCIA card may only be compatible with certain versions of Windows. For example, if your computer is running Windows 2000, the dual serial port PCMCIA card(s) must be revision C or higher.

- Check the card manufacturer's specifications to ensure compatibility.

- Windows 2000 requires that anyone installing hardware drivers must have System Administrator rights. If you do not currently have System Administrator rights for the computer on which the E6473B drivers need to be installed, you must contact your site's IT Support for assistance. They can either grant you the rights you need to install the drivers, or they can log onto your computer and perform the installation for you.

Phone Connections

1 Connect the phones to their respective interface cables.

2 If necessary, connect the phone interface cable to the 9-to-26 pin adapter. (Non-TDMA phones can be directly connected to the serial port without an adapter when an OEM cable is used.)

3 Connect the dual serial port PCMCIA data cables to the dual serial port PCMCIA card.

4 Connect the adapter of one phone interface cable to the data cable from the dual serial port PCMCIA card.

5 Connect the adapter of the second phone interface cable to the data cable from the dual serial port PCMCIA card.

Devices Connected Through an E6473B High Speed Direct Connect Hub

The E6473B High Speed Direct Connect Hub expands the serial communication capabilities of the computer. The computer and hub communicate via the Universal Serial Bus (USB). The Hub converts the USB to six serial (COM) ports, which are in turn connected to the devices. To the E6474A data collection software, the devices appear to be directly connected to six serial (COM) ports of the computer.

Up to two phones and two E645xx receivers, or two phones and one E746xx scanner can be connected to the Hub. It also provides power to all devices, phone battery charging, phone audio monitoring, and a serial port for a GPS receiver or GPS/DR navigator. In certain configurations, the Hub can support more than two phones via the AUX port and the Downstream USB ports.

The Hub is technology independent. The combination of a software license key and phone interface cable determine what E6474A software features are available.

To permanently install an E6473B High Speed Direct Connect Hub, see Appendix E, Permanent In-Vehicle Hardware Installation.

Phone and Receiver Options

A system equipped with the E6473B High Speed Direct Connect Hub option is available in a variety of configurations:

- One, two, or no tracking phones
- With or without an E7468A GSM Dual Band Scanner. The E746xx Dual Band Scanner has up to two RF antenna connectors or one RF and 1GPS for CDMA PN**.**
- With one, two, or no E645xx Receivers (with or without the GPS option). An E746xx CDMA or JCDMA PN Scanner has one RF antenna connector and one GPS antenna connector.

NOTE   You cannot combine an E746xx Scanner and an E645xx Receiver with the same E6473B High Speed Direct Connect Hub.

Dual Serial Port PCMCIA Card

If your system is equipped with two or more phones and does not include an E6473B High Speed Direct Connect Hub, install the Dual Serial Port PCMCIA card per the manufacturer's instructions. Connect the phones to the card with the cables provided (see Figure 1). Refer to "Devices Connected Through an E6473B High Speed Direct Connect Hub" on page 33.

Figure 1   Connecting the phone via a PCMCIA card

Mounting the Hub

1 Rotate the locking knobs horizontally to allow devices to slide into the slots of the chassis.

2 Insert the Hub into the top slot of the chassis.

3 If equipped, insert the Agilent direct connect GPS/DR or a second direct connect Hub into the bottom slot of the chassis.

4 Rotate the locking knobs to a vertical position, and tighten the screws.

Mounting the Hub and Scanner or Receiver

1 If you currently have the Direct Connect Hub in the carry pack for indoor testing, remove the Direct Connect Hub from the metal chassis that houses the battery..

2 If equipped, attach the E645xx Receiver(s) to the receiver mounting plate with the straps provided.

Navigation Options

The E6474A software supports many navigators. Two navigation options are available for in-vehicle installations:

- GPS/DR Navigator. See"Communicating with the Agilent Direct Connect GPS/DR" on page 45.

- Garmin II Plus GPS receiver. An operator's manual and interface cable is supplied with the receiver. Connect the interface cable per the instructions under "Garmin GPS Receiver Connections" on page 41. The receiver can be powered by internal batteries or by vehicle power.

Gyro Positioning

To avoid inaccuracies in dead reckoning, the Gyro in the Agilent Direct Connect GPS/DR must be positioned so that it is within 10 degrees of vertical or horizontal. The Gyro must be set to indicate the Up position on the unit as follows:

1 Position the unit either horizontally or on its right edge (vertically).

2 Turn the **Gyro Position** knob counter-clockwise to loosen it.

3 Slide the pin so that it indicates the applicable **Up** position.

4 Turn the **Gyro Position** knob clockwise to tighten it.
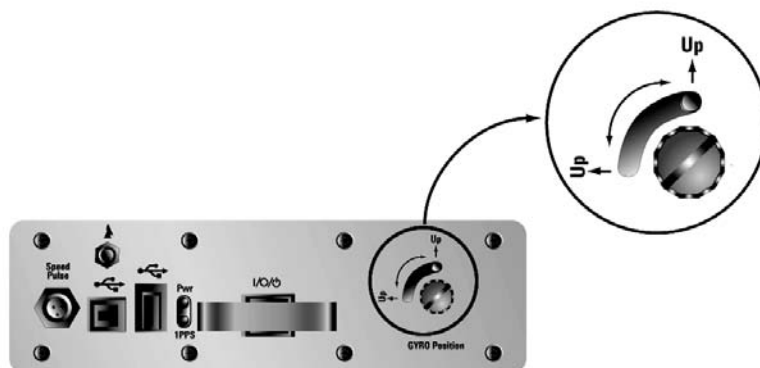
Figure 2   Setting the Gyro pin. If the unit is set on its right side, the pin is set at the alternat position.

Connecting the Speed Pulse

CAUTION   The dead reckoning system is comprised of the Gyro and the Speed Pulse (odometer) connection. The connection of the Speed Pulse cable is vehicle-specific and should be performed by persons trained to do such installations.

When connecting the Speed Pulse cable, the following wiring scheme is used:

Color	Connection
Red	Speed Pulse (odometer)
Black	Ground
White	Backup (seldom used; not necessary for proper operation)
Shield	

Cable Connections

Direct Connect Hub with Scanner

Before you connect the cables, install the power, USB data, phone extender, and antenna cables, then route them through the vehicle. (See Appendix E, Permanent In-Vehicle Hardware Installation, for instructions.) Figure 3 shows the direct connect hub connected to the scanner and then connected to the laptop.
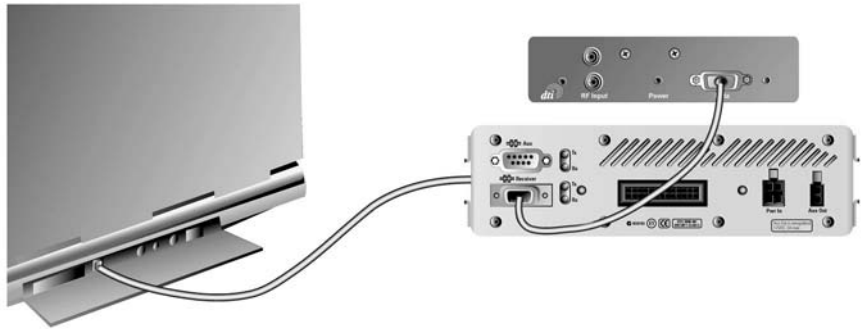
Figure 3   Direct connect hub connected to a scanner

> **NOTE**   Refer to Appendix D, "System Information", for antenna and phone interface cable part numbers.

E6473B High Speed Direct Connect Hub Connections

> **NOTE**   If your system includes two Direct Connect Hub units, see "Connecting Two Direct Connect Hub-Systems" on page 55.

1 Connect the scanner data/power cable (E6473-60083) to the ⊞ RECEIVER port on the rear panel. See Figure 4.

DTI scanner

scanner data/
power cable
E6473-60083

Direct Connect Hub

Can connect to any device with a
dB9 Interface (phones, scanners,
GPS Navigators.

to vehicle
power
E6473-60004
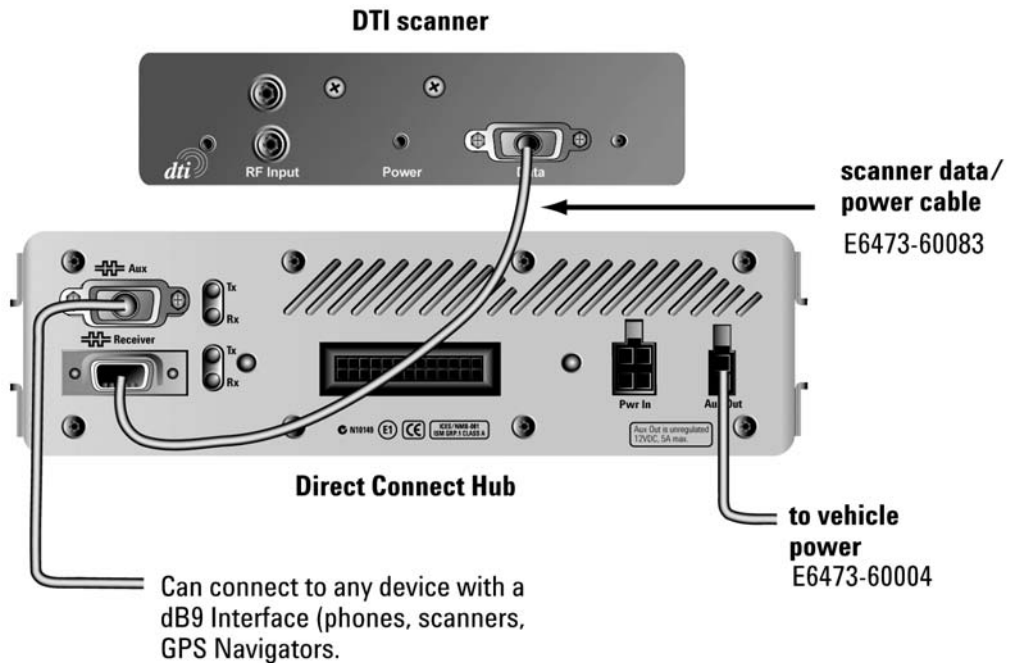
Figure 4   Data and power connections

2 Connect the main power cable (E6473-60003 or
E6473-60004) to the PWR IN connector on the rear panel.

3 If programmed, insert the software license key into a 🔌
(USB Downstream) port on the front panel. Otherwise, plug
the DB25 key into the parallel port of the computer.

4 Connect the USB cable (E6473-60010) to the 🔌 (USB
Upstream) port on the front panel.

5 Connect the phones and headsets as described on
"Phones" on page 55. See Figure 5.
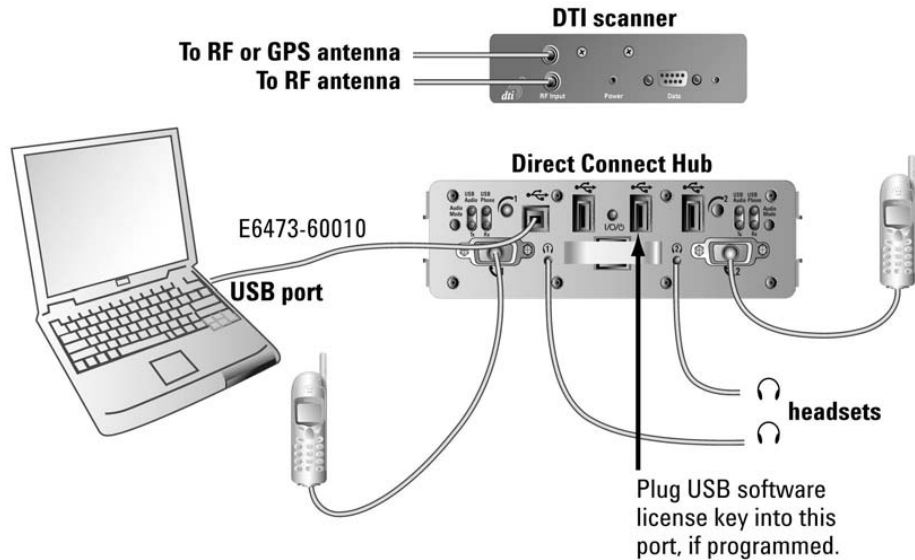
Figure 5   Peripheral connections

E746xx Scanner Connections

Refer to Appendix D, System Information, for antenna part numbers.

1 Connect the opposite end of the scanner data/power cable (E6473-60083) to the ⬕ SCANNER port on the rear panel.

2 For a single band scanner, connect the antenna cable to the antenna connector on the front panel.

3 For a dual band or PN scanner, connect the lower band RF antenna cable to the lower antenna connector on the front panel.

4 For a dual band or PN scanner, connect the upper band RF or GPS antenna cable to the upper antenna connector on the front panel.

Computer Connections

1 Connect the opposite end of the USB cable (E6473-60010) to the USB port of the computer.

2 If equipped, connect the power cable from the computer to the 4-to-1 lighter socket adapter.

Garmin GPS Receiver Connections

If your system is equipped with a Garmin GPS receiver, follow these steps:

1 Connect the interface cable to the receiver. See Figure 6.
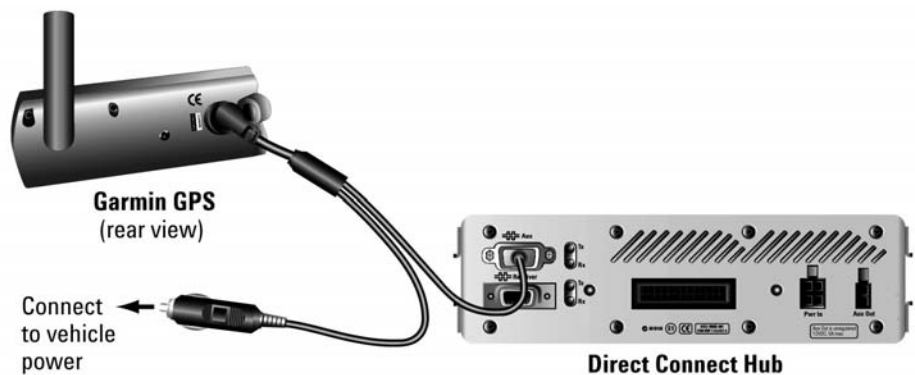
Figure 6   Connect the GPS to the AUX connector

2 Connect the D-shell connector of the cable to the ⎓ AUX port on the rear panel of the Direct Connect Hub. See Figure 6.

3 Connect the power plug to the 4-to-1 lighter socket adapter.

Direct Connect Hub with Scanner and Agilent Direct Connect GPS/DR

Before you connect the cables, install the power, USB data, handset extender, antenna, and speed pulse cables, and route them through the vehicle. (See Appendix E, Permanent In-Vehicle Hardware Installation, for instructions.

NOTE   Refer to Appendix D, "System Information," starting on page 179 for antenna and phone interface cable part numbers.
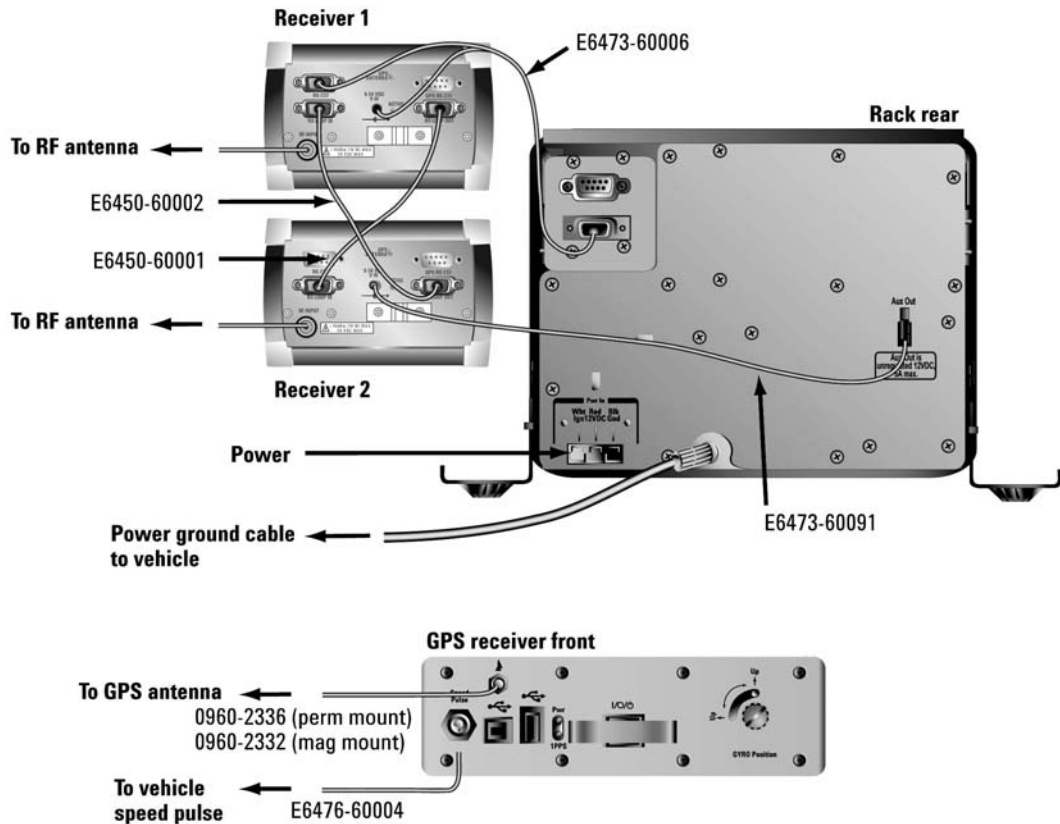
Figure 7   Data and power connections

E6473B High Speed Direct Connect Hub Connections

If your system includes two Direct Connect Hub units, see "Connecting Two Direct Connect Hub-Systems" on page 55.

1 Connect the scanner data/power cable (E6473-60083) to the ⊐╫╤ RECEIVER port on the rear panel. See Figure 8.

2 Connect the Direct Connect Hub power cable (E6473-60084) to the PWR IN connector on the rear panel.

3 Connect the navigator data cable (E7484-60005) to the ⊐╫╤ AUX port on the rear panel.

4 If programmed, insert the software license key into the ⟝⟨ (USB Downstream) port on the front panel. Otherwise, plug the DB25 key into the parallel port of the computer.

5 Connect the USB cable (E6473-60010) to the ⟝⟨ (USB Upstream) port on the front panel.

6 Connect the phones and headsets as described under "Phones" on page 55. See Figure 8.

Figure 8   Peripheral connections

E746xx Scanner Connections

Refer to Appendix D, System Information for antenna part numbers.

1 Connect the opposite end of the scanner data/power cable (E6473-60083) to the ⊞ SCANNER port on the rear panel.

2 For a single band scanner, connect the antenna cable to the antenna connector on the front panel.

3 For a dual band or PN scanner, connect the lower band RF antenna cable to the lower antenna connector on the front panel.

4 For a dual band or PN scanner, connect the upper band RF or GPS antenna cable to the upper antenna connector on the front panel. See Figure 9.
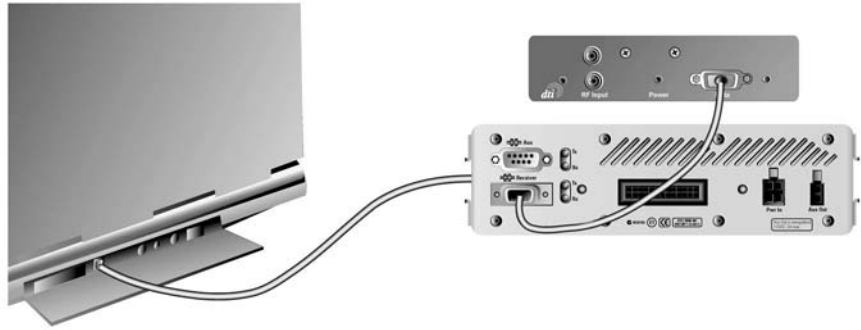
Figure 9   Direct connect hub connected to a scanner

Communicating with the Agilent Direct Connect GPS/DR

There are two method for communicating with the Agilent Direct connect GPS/DR:

• Connecting the serial cable's DB9 connector to the PC's DB9 port.

• Connecting the USB cable to the USB Upstream port.

NOTE   Users should not attempt to connect a USB cable and serial cable simultaneously. If both are connected, the serial connection is active by default.

Direct Connect Hub with Receivers

A system with two receivers is shown in Figure 10. If your system has only one receiver, disregard all connections shown to receiver 2.

NOTE   Refer to Appendix D, "System Information," starting on page 179 for antenna and phone interface cable part numbers.
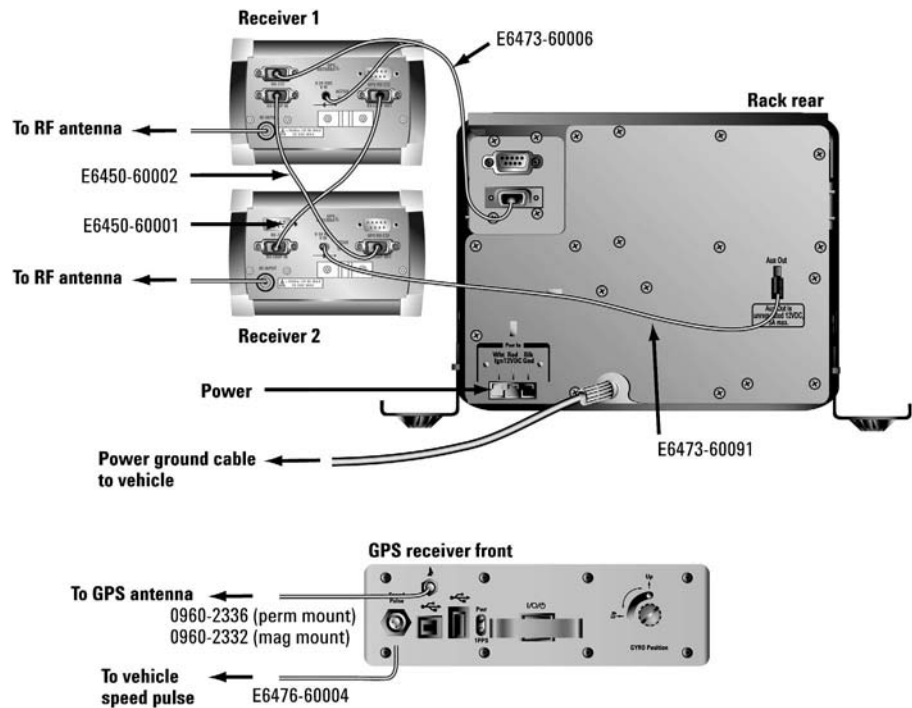
Figure 10   Data and power connections

E6473B High Speed Direct Connect Hub Connections

If your system includes two Direct Connect Hub units, see "Connecting Two Direct Connect Hub-Systems" on page 55.

1 Connect the data/power cable (E6473-60006) to the ⊞ RECEIVER port on the rear panel.

2 Connect the main power cable (E6473-60003 or E6473-60004) to the PWR IN connector on the rear panel.

3 If equipped, connect the second receiver power cable (E6473-60091) to the AUX PWR OUT connector on the rear panel.

4 If programmed, insert the software license key into the ⟜ (USB Downstream) port on the front panel. Otherwise, plug the DB25 key into the parallel port of the computer.

5 Connect the USB cable (E6473-60010) to the ⟵⟶ (USB Upstream) port on the front panel.

6 If equipped, connect the phones and headsets as described under "Phones" on page 55. See Figure 11.
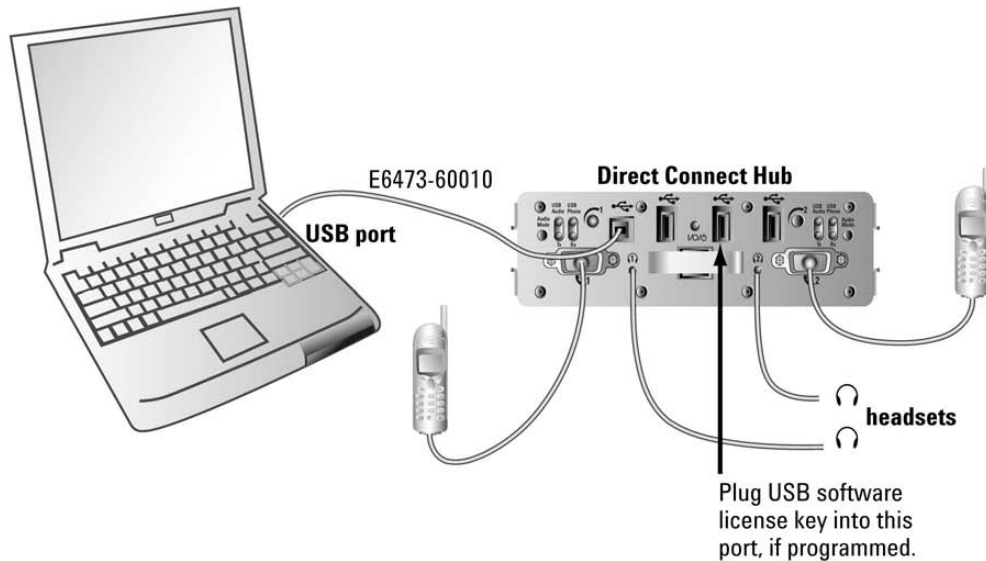
Figure 11 Peripheral connections

Single E645xx Receiver Connections

Refer to Appendix D, "System Information," starting on page 179 for antenna part numbers.

1 Connect the D-shell connector end of the data/power cable (E6473-60006) to the RS-232 port of the receiver.

2 Connect the power plug of the data/power cable to the 9-34 VDC connector of the receiver.

3 Connect the antenna cable for the receiver the RF INPUT connector.

4 If the receiver is equipped with the GPS option, connect the GPS antenna to the GPS antenna connector of the receiver. See Figure 12.

NOTE	For more information about connections for GPS options, see "Navigation Options" on page 36.

Figure 12   Single receiver connections

Second E645xx Receiver Connections

1 Connect the power plug of the second receiver power cable (E6473-60091) to the 9-34 VDC connector.

2 Connect the short Rx Loop cable (E7450-60001) to the RX LOOP IN port of Receiver # 1. See Figure 13.
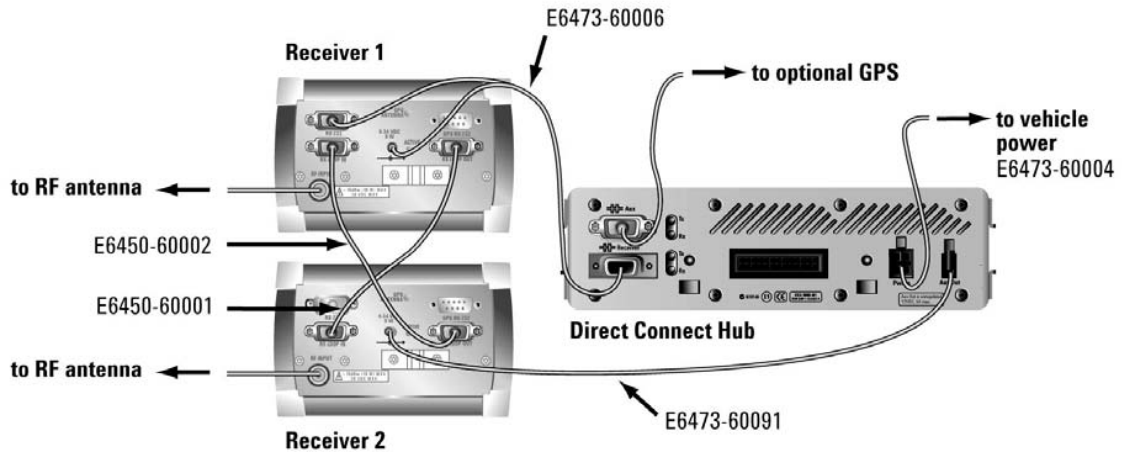
Figure 13   Data and power connections

3 Connect the opposite end of the cable to the RX LOOP OUT port of Receiver # 2.

4 Connect the long Rx Loop cable (E7450-60002) to the RX LOOP OUT port of Receiver # 1.

5 Connect the opposite end of the cable to the RX LOOP IN port of Receiver # 2.

6 Connect the antenna cable for the receiver the RF INPUT connector.

7 If the receiver is equipped with the GPS option, connect the GPS antenna to the GPS ANTENNA connector of the receiver.

Computer Connections

NOTE When using the internal receiver GPS with multiple receivers, you must use the GPS in the first receiver of the series.

1 Connect the opposite end of the USB cable (E6473-60010) to the USB port of the computer.

2 If equipped, connect the power cable from the computer to the 4-to-1 lighter socket adapter.

Direct Connect Hub with Receivers and Agilent Direct Connect GPS/DR

A system with two E645xx receivers is shown in Figure 14. If your system has only one receiver, disregard all connections shown to Receiver 2.

**NOTE**   Refer to Appendix D, "System Information", for antenna and phone interface cable part numbers.
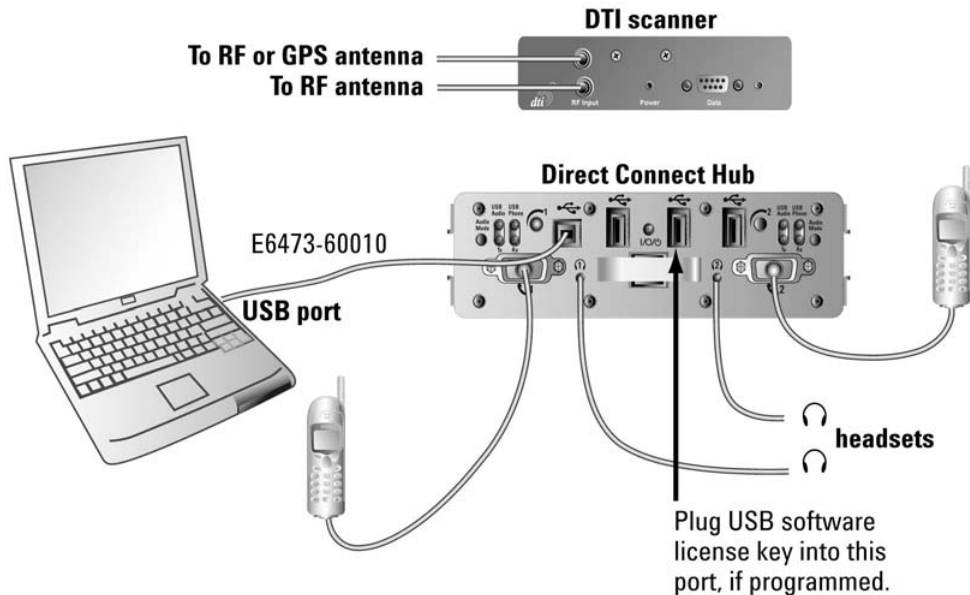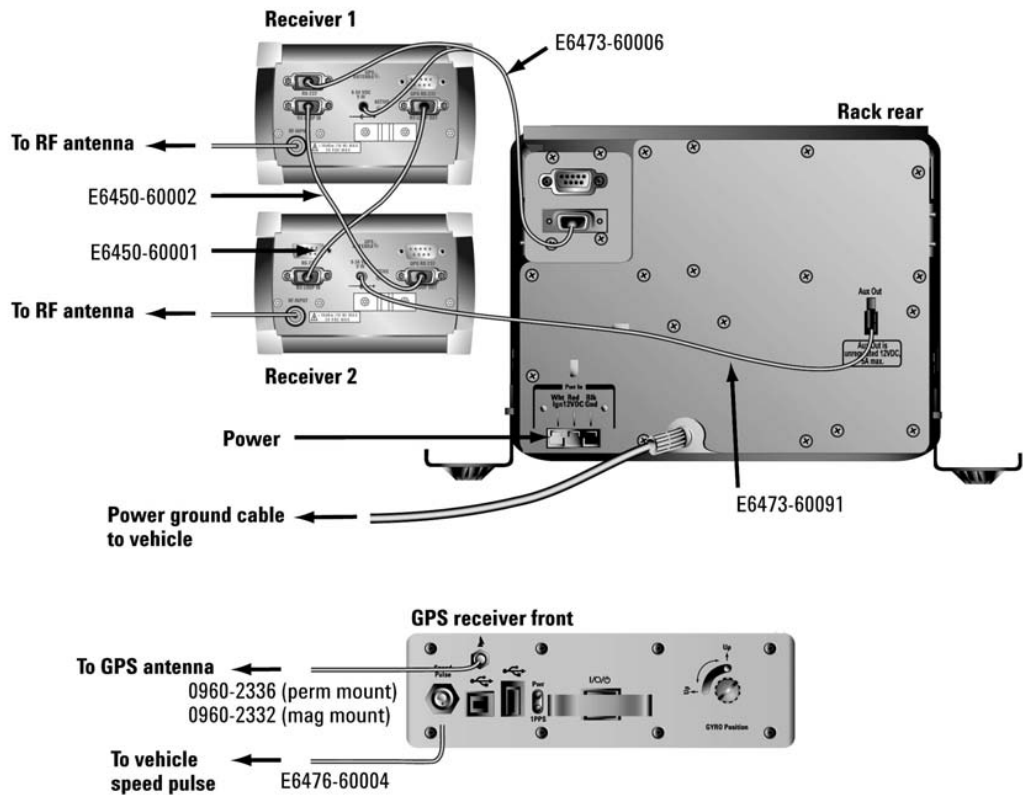
Figure 14   Data and power connections

E6473B High Speed Direct Connect Hub Connections

If your system includes two Direct Connect Hub units, see "Connecting Two Direct Connect Hub-Systems" on page 55.

1 Connect the data/power cable (E6473-60006) to the ⊞⊞ RECEIVER port on the rear panel.

2 Connect the Direct Connect Hub power cable (E6473-60084) to the PWR IN connector on the rear panel.

3 Connect the navigator data cable (E7484-60005) to the AUX port on the rear panel.

4 If equipped, connect the second receiver power cable
   (E6473-60091) to the AUX PWR OUT connector on the rear
   panel.

5 If programmed, insert the software license key into one of
   the ⟷ (USB Downstream) port on the front panel.
   Otherwise, plug the DB25 key into the parallel port of the
   computer.

6 Connect the USB cable (E6473-60010) to the ⟷ (USB
   Upstream) port on the front panel.

7 If equipped, connect the phones and headsets as described
   under "Phones" on page 55.
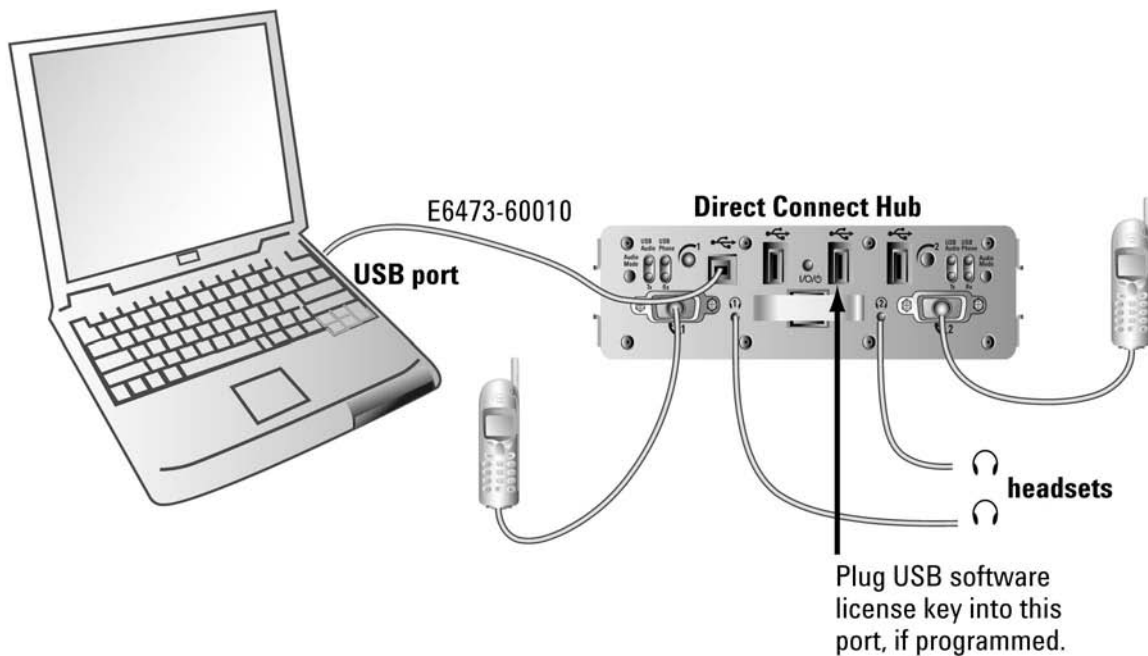
Figure 15   Peripheral connections

Single E645xx Receiver Connections

Refer to Appendix D, "System Information," starting on page 179 for antenna part numbers.

1 Connect the D-shell connector end of the data/power cable (E6473-60006) to the RS-232 port of the receiver.

2 Connect the power plug of the data/power cable to the 9-34 VDC connector of the receiver.

3 Connect the antenna cable for the receiver to the RF INPUT connector.

4 If you have a cdmaOne or cdma2000 receiver, connect the 1 PPS cable (86156-60004) to the GPS RS-232 port.

Second E645xx Receiver Connections

1 Connect the power plug of the second receiver power cable (E6473-60091) to the 9-34 VDC connector.

2 Connect the short Rx Loop cable (E7450-60001) to the RX LOOP IN port of Receiver # 1.

NOTE Refer to Appendix D, System Information, for antenna and phone interface cable part numbers.
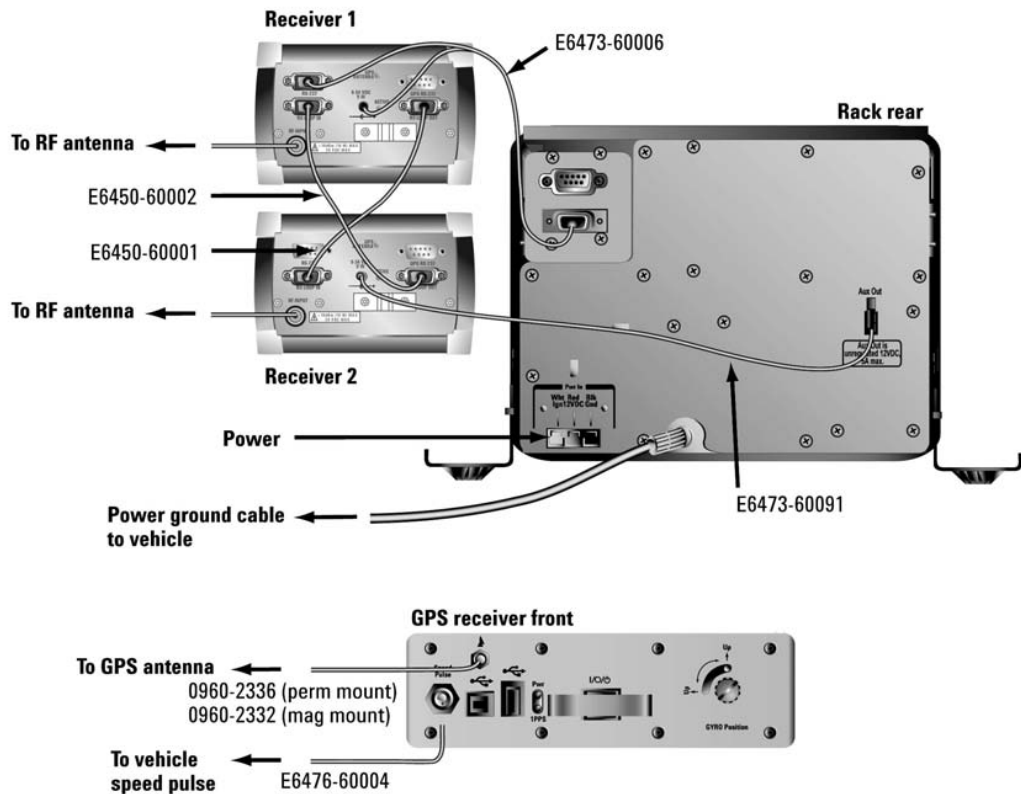
Figure 16   Data and power connections

3 Connect the opposite end of the cable to the RX LOOP OUT port
of Receiver # 2.

4 Connect the long Rx Loop cable (E7450-60002) to the RX LOOP
OUT port of Receiver # 1.

5 Connect the opposite end of the cable to the RX LOOP IN port
of Receiver # 2.

6 Connect the antenna cable for the receiver the RF INPUT. If
you have a cdmaOne or cdma2000 receiver, connect the free
end of the 1 PPS cable (86156-60004) to the NAV/RTCM port.

Computer Connections

1 Connect the free end of the USB cable (E6473-60010) to the USB port of the computer.

2 If equipped, connect the power cable from the computer to the 4-to-1 lighter socket adapter.

Connecting Two Direct Connect Hub-Systems

If your system includes two Direct Connect Hub units, connect them together as follows:

1 Connect the USB cable (E6473-60005) to the ⬷ (USB Downstream) port on the front panel of the Direct Connect Hub connected to the computer.

2 Connect the opposite end of the cable to the ⬷ (USB Upstream) port on the front panel of the second Direct Connect Hub.

3 If programmed, insert the software license key into the ⬷ (USB Downstream) port on the front panel of any available USB Downstream. Otherwise, plug the DB25 key into the parallel port of the computer.

Phones

The phone cable set includes a 3 foot (approx. one meter) phone interface cable, a 15 foot (aaprox. 4.5 meters) extender cable (E6473-60042), and a 9-to-26 pin adapter, that allows the phone cable to be plugged into a Serial port of the computer for a "direct connect" configuration (see To a Computer Serial Port below).

Direct Connect Hub Connections

CAUTION   To prevent damage to the Direct Connect Hub or phone, always power the Direct Connect Hub **off** before connecting or disconnecting a phone.

1 Connect the phone interface cable(s) to the phone(s).

2 If you are using the extender cables, connect a phone extender cable to each phone interface cable.

3 Connect the opposite end of the phone interface cable (or extender cable) to the ◌ (Phone 1) port of the Direct Connect Hub. See Figure 17.

Figure 17   Connecting a phone to the direct connect hub

4 Connect the opposite end of the second phone interface cable (or extender cable) to the ◌ (Phone 2) port of the Direct Connect Hub.

5 Connect the headsets (E6473-60017) to the headset connectors of the Direct Connect Hub.

Computer Serial Port Connections

If your system is equipped with two or more phones and does not include an E6473B High Speed Direct Connect Hub, install the Dual Serial Port PCMCIA card per the manufacturer's instructions. (See Figure 18.)

1 Connect the phone interface cable to the phone.

2 If you are using the extender cable (E6473-60042), connect it to the phone interface cable.

3 Connect the 26 pin end of the 9-to-26 pin adapter (E6473-60015) to the phone interface cable (or extender cable).

4 Connect the 9-pin end of the adapter to the Serial port of the computer. See "External Antennas" on page 58.

NOTE	Phone battery charging and audio monitoring are not supported with direct connect phones.

Figure 18   Connecting a phone via a PCMCIA card

External Antennas

The following phone interface kits include antenna adapters. If your system includes one of the phone interface kits listed in "Adapters used in kits" on page 58, follow these steps:

1 Connect the antenna adapter to the phone.

2 Connect the antenna extender cable (E6473-60105) to the appropriate adapter, if necessary. (Two adapters are included with the antenna kit). The antenna extender cable connectors are both FME female type.

3 Connect the antenna to the extender cable.

4 Mount the antennas on the roof of the vehicle, with at least 18" (approx. 46 cm) between antennas.

Table 1   Adapters used in kits

Phone interface kit part number	Use with phone(s)	Adapter part number	Adapter type
E6473-803	QCP 860, 1960, and 2760	E7483-60002	TNC female
E6473-830	Nokia 61xx	E7484-60023	FME male

Phone antenna kit part number	Use with frequency bands	TNC male to FME male adapter part number	FME male to FME male Adapter part number
E6473-898	900/1800 MHz	E6473-60101	E6473-60102
E6473-899	800/1900 MHz	E6473-60101	E6473-60102

Pulse Trigger Device

The E6455A, E6456A, and E645xC receivers accommodate a pulse trigger device. The device you use must meet the following receiver input requirements:

- Cable with BNC male connector (the Agilent pulse trigger cable input is female BNC)
- Falling-edge triggered
- TTL threshold

- 15 volt maximum pulse level

- 100 nanosecond minimum pulse width of period

- 300 microsecond minimum pulse

Follow the manufacturer's instructions for installing the pulse trigger device. Connections to the receiver are shown in Figure 19.

- If you have two receivers, connect the pulse trigger cable (E7450-60015) to the Rx Loop In and Rx Loop Out ports as shown in Figure 19.

- Or, if you have one receiver, connect the pulse trigger cable to the Rx Loop In and Rx Loop Out ports of the same receiver.

- Connect the cable from the pulse trigger device to the BNC connector of the pulse trigger cable. For software configuration and calibration instructions, refer to the online help. Search for "wheel pulse unit setup" to locate the information.
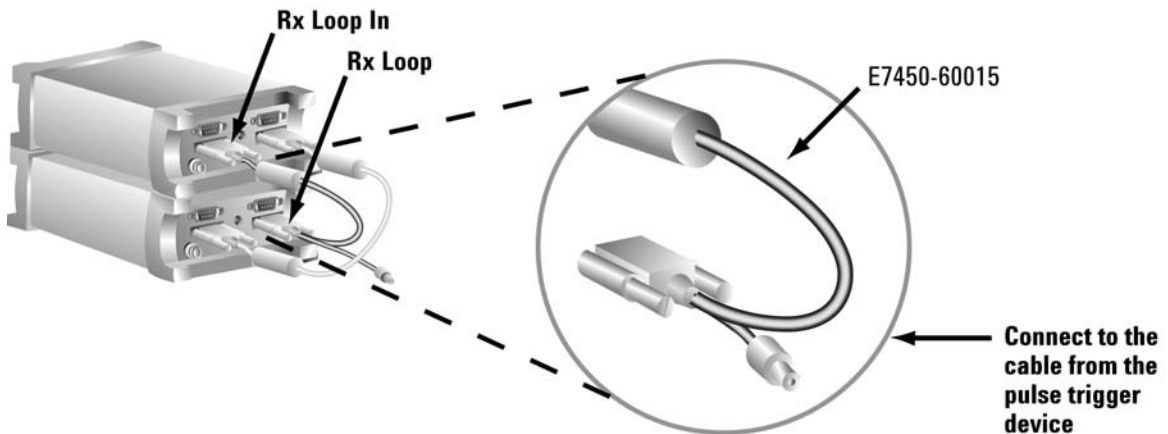
Figure 19   Connecting the pulse trigger cable

Portable System Setup

This section contains instructions for setting up a new portable system. A single lithium-ion battery powers the portable system. Always charge all batteries before beginning a survey. Refer to "Using Portable Components in a Vehicle" on page 83 for charging and care information.

Software License Key

A DB25 software license key determines which software options are enabled. Connect it to the parallel port of the computer. You can transfer the license information from it to the USB key using the License Manager software that is included with the E6474A or E74xx software. Refer to the License Manager's online help for instructions.

Phone and Receiver Options

A system equipped with the E6473B High Speed Direct Connect Hub option is available in a variety of configurations, however you cannot use an E746xx Scanner and an E645xx Receiver with the same E6473B High Speed Direct Connect Hub.

A system can be equipped with:

- One, two, or no tracking phones
- Or without an E746xx Scanner
- One, two, or no E645xx Receivers

Dual Serial Port PCMCIA Card

If your system is equipped with two or more phones and does not include an E6473B High Speed Direct Connect Hub, install the Dual Serial Port PCMCIA card per the manufacturer's instructions. Connect the phones to the card with the cables provided.

Portable System Cable Connections

Cable connections to the rear panels should be made before the E6473B High Speed Direct Connect Hub, the battery pack, and the optional Scanner are loaded into the carry bag. Cable connections to the front panels can be made after the components are inserted into the carry bag. If the system is not equipped with a scanner or receiver, no cable connections are made to the rear panel of the E6473B High Speed Direct Connect Hub.

An E7468A Dual Band Scanner has two RF antenna connectors. Labels on the front panel identify the bands.

Phone Only System

This section describes the cable connections for a portable system equipped with a phone. This configuration is housed in the carry pack hub kit, E6473B option 022 .

Chassis Assembly

NOTE   Refer to Appendix D, "System Information", for antenna and phone interface cable part numbers.

1 Rotate the locking knobs horizontally to allow devices to slide into the slots of the chassis.

2 Insert the Hub into the top slot of the chassis.

3 Insert the battery into the bottom slot of the chassis.

4 Rotate the locking knobs to a vertical position, and tighten the screws.

NOTE   The battery is keyed, and can only be properly inserted into the chassis when the connectors are aligned.

Insert Direct Connect Hub in upper slot of chassis.

Locking knobs:
After inserting the battery, the knobs should be turned vertical and the screws tightened to lock in place.

Insert battery in lower slot of chassis.
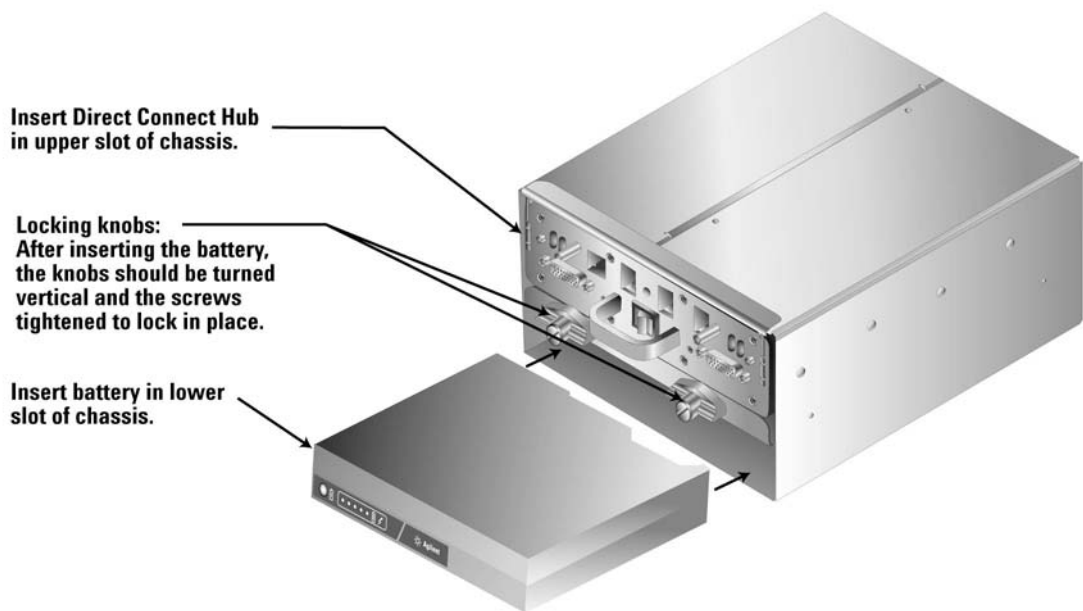
Figure 20   Inserting the battery into the chassis

5 Insert the chassis assembly into the carry pack as shown in Figure 21.
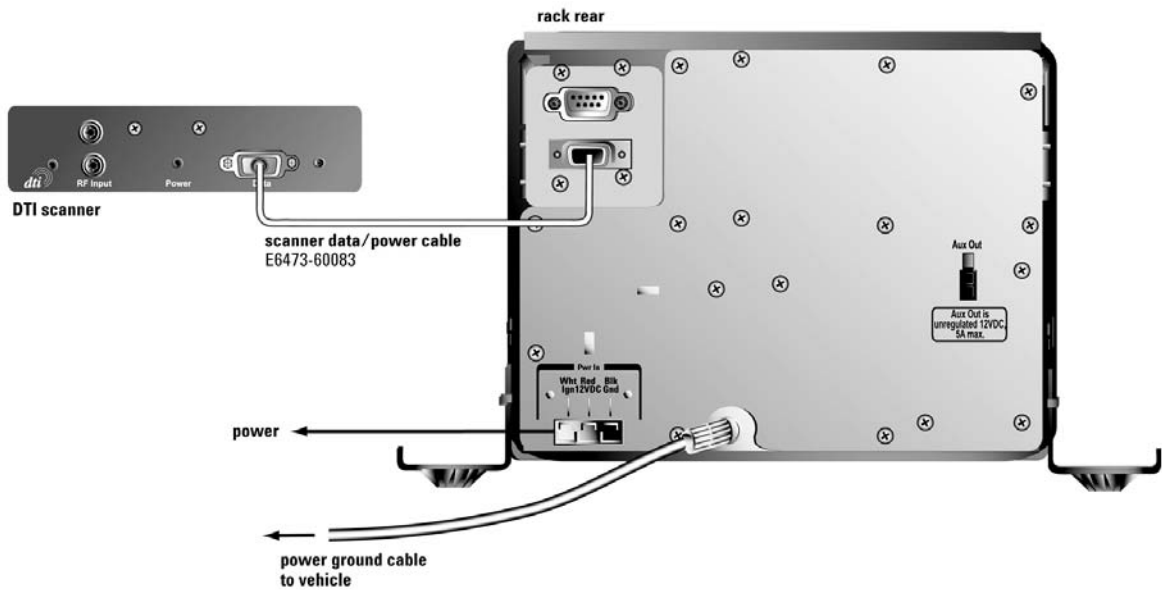
Figure 21   Carry pack, showing the rear panels of modules

E6473B High Speed Direct Connect Hub and E746xx Scanner Connections

1 Open the rear cover of the pack, then connect the data/power cable (E6473-60083) to the ⌁⊞⌁ RECEIVER port of the Direct Connect Hub. See Figure 22.
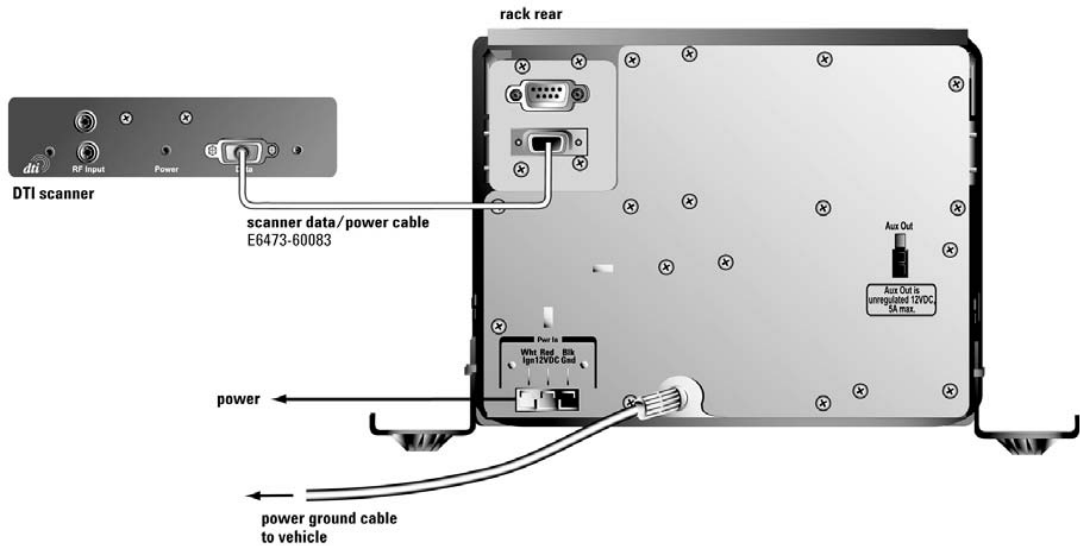
Figure 22   Data and power connections

2 Connect the opposite end of the cable to the ⌁⊞⌁ SCANNER port of the Scanner.

3 Connect the USB cable (E6473-60005) to the ⟜⟨ (USB Upstream) port on the Direct Connect Hub front panel.

4 Connect the opposite end of the USB data cable to the USB port of the computer.

5 If programmed, insert the software license key into the ⟜⟨ (USB Downstream) port on the front panel. Otherwise, plug the DB25 key into the parallel port of the computer.

6 Connect the phones and headsets as described under "Phone Connections" on page 81. (See Figure 23 on page 65.)

DTI scanner

To RF or GPS antenna
To RF antenna

Direct Connect Hub

E6473-60010

USB port

headsets

Plug USB software
license key into this
port, if programmed.
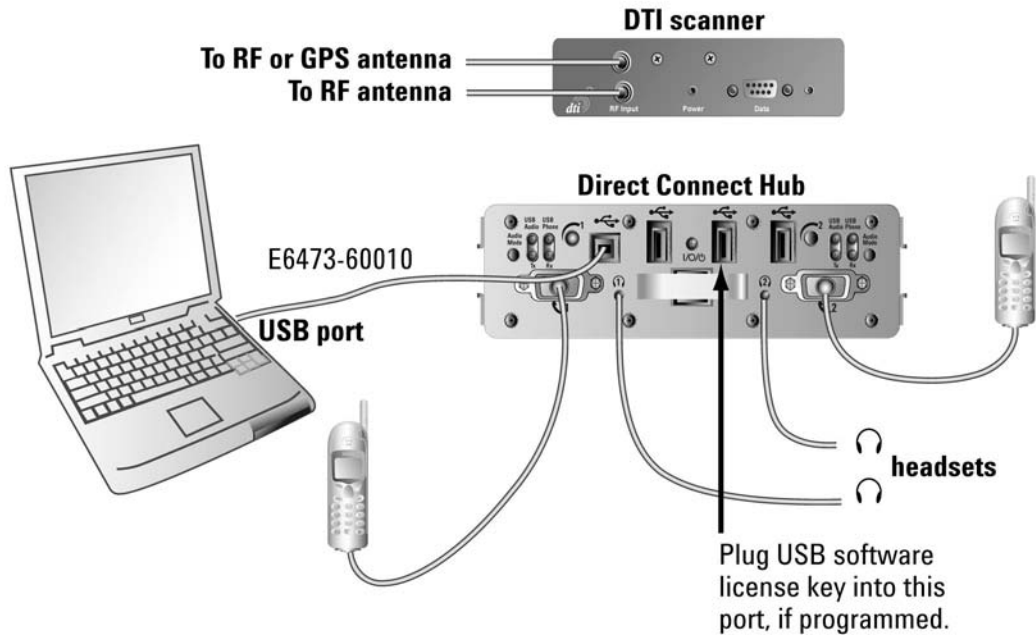
Figure 23   Peripheral connections

E746xx Scanner Antenna Connections

1 For a single band scanner, connect the antenna cable to the antenna connector on the front panel.

2 For a dual band or PN scanner, connect the lower band RF antenna cable to the lower antenna connector on the front panel.

3 For a dual band or PN scanner, connect the upper band RF or GPS antenna cable to the upper antenna connector on the front panel.

Carry Pack Final Assembly

1 Route the antenna, phone, and computer cables through the openings provided.

2 Close all open panels.

3 Attach the clip-on scanner antenna to the pocket of pack. See Figure 26 on page 67 for an example.

Using Carry Pack Assembly with the Shoulder Strap

See Figure 24 on page 66 for an example.

1 Attach the shoulder strap to the D-rings.

2 Slip the shoulder strap around your neck.
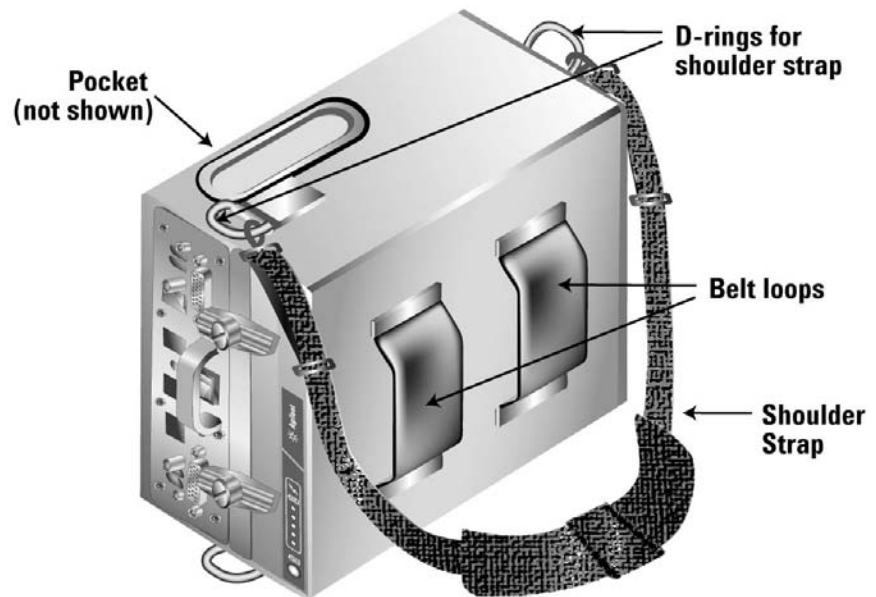
Figure 24   Side view of the carry pack showing the shoulder strap

Using the Carry Pack as a Backpack

1 Adjust the waist belt for a snug fit around your waist, then remove it.

2 Feed the waist belt through the belt loops of the pack, as shown in Figure 25 on page 67. The black mesh should be on the outside.
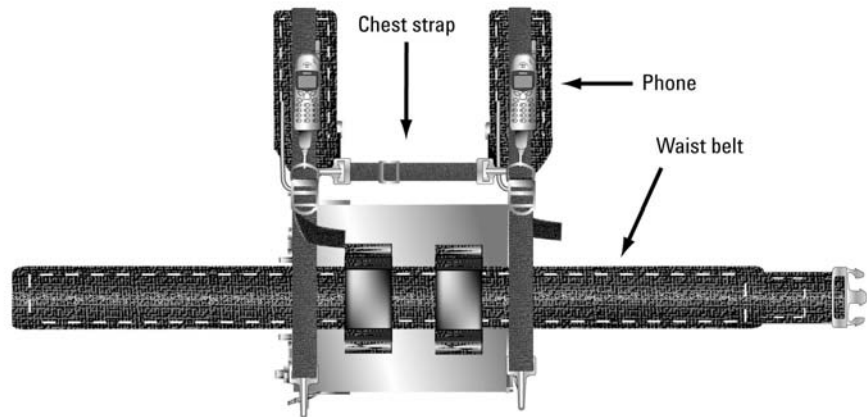
Figure 25   Carry pack inside view

3 Connect the two shoulder straps to the D-rings of the pack as shown in Figure 26.
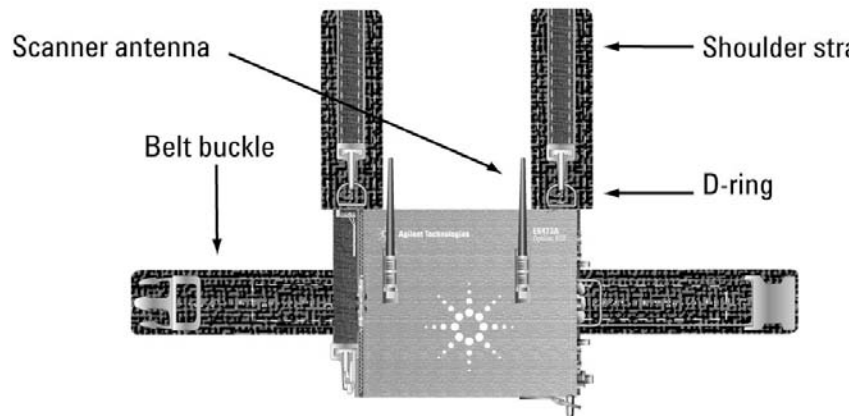
Figure 26   Carry pack outside view

4 Mount the pack to your body, then connect the buckle of the waist strap. See Figure 27 on page 68.
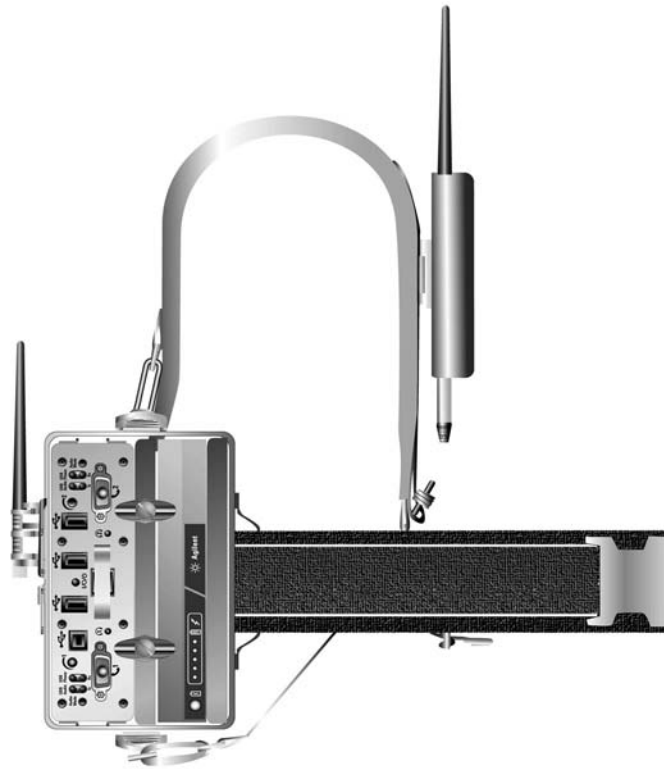
Figure 27   Carry pack side view

5 Adjust the shoulder straps.

6 Connect the chest strap to the D-rings of the shoulder straps as shown in Figure 25 on page 67.

7 Adjust all straps for a comfortable fit.

Portable Single E645xx Receiver System

This section describes the cable connections for a system equipped with one E645xx receiver. This configuration is housed in a single receiver backpack hub kit,

E6473B option 023. The carry bag contains a bracket that secures the Direct Connect Hub and the battery, and provides the power connection between them.

NOTE   Refer to Appendix D, "System Information", for antenna and phone interface cable part numbers.

Chassis and Backpack Assembly

Use the straps provided to secure all components within the single receiver backpack.

1 Insert the battery into the chassis, and then push until it locks in place, as shown in Figure 20 on page 62.

NOTE   The battery is keyed, and can only be properly inserted into the chassis when the connectors are aligned.

2 Align the tabs of the Direct Connect Hub with the slots in the chassis, then attach it to the chassis by pushing it rearward until it locks in place.

3 Secure the chassis assembly within the right side of the backpack.

4 Secure the E645xx Receiver within the left side of the backpack.

E6473B High Speed Direct Connect Hub Connections

1 Open the rear cover of the pack, then connect the data/power cable (E6473-60006) to the ⊶╫╫⊶ RECEIVER port on the rear panel. See Figure 28.
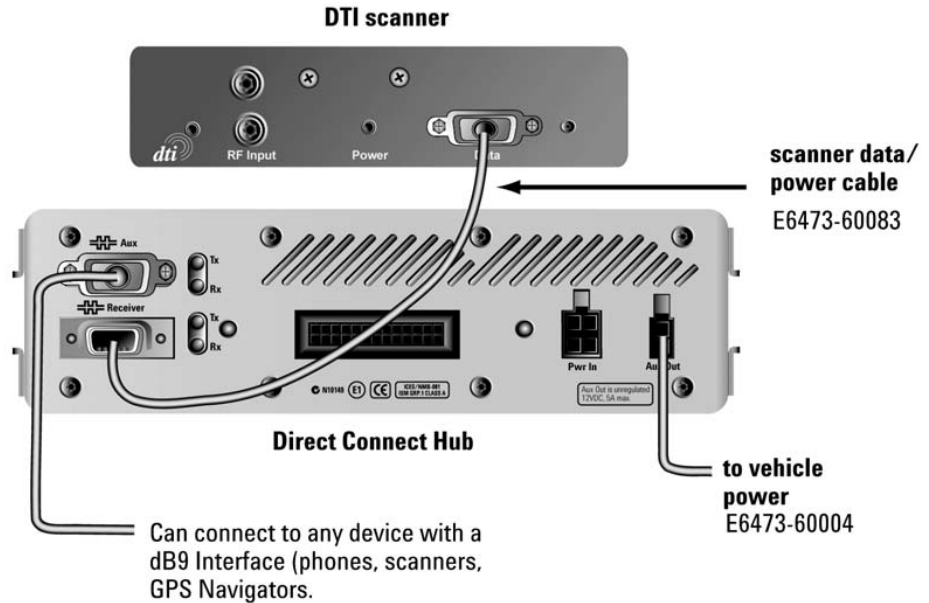
Figure 28 Data and power connections

2 If programmed, insert the software license key into the ⟛⟜ (USB Downstream) port on the front panel. Otherwise, plug the DB25 key into the parallel port of the computer.

3 Connect the USB data cable (E6473-60005) to the ⟛⟜ (USB Upstream) port on the front panel.

4 Connect the opposite end of the USB data cable to the USB port of the computer.

5 Connect the phones and headsets as described under "Phone Connections" on page 81. See Figure 29.
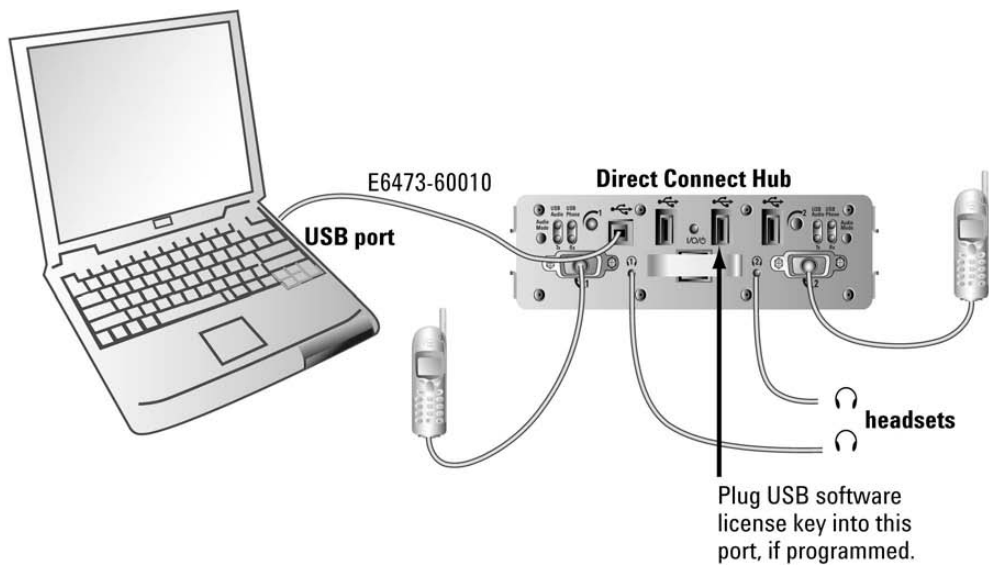
Figure 29   Peripheral connections

E645xx Receiver Connections

1 Connect the D-shell connector end of the receiver data/power cable (E6473-60006) to the RS-232 port.

2 Connect the power plug of the receiver data/power cable to the 9-34 VDC connector.

3 Connect the receiver antenna cable to the RF INPUT connector of the receiver.

Final Assembly

1 Route the USB, antenna, and phone cables through the openings provided. See Figure 30.
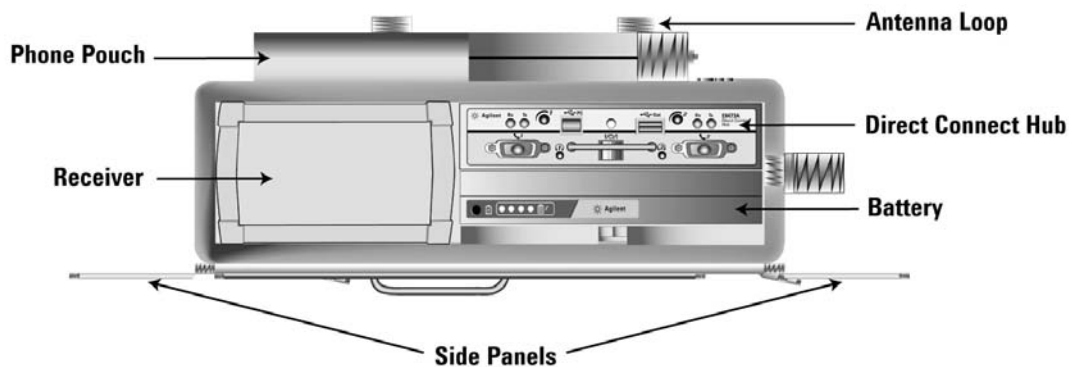
Figure 30   Single receiver backpack (right side view)

2 Close all open panels.

3 Attach the clip-on receiver antenna to the antenna loop of the pack.

4 Attach the shoulder strap to the D-rings of the pack. See Figure 31.
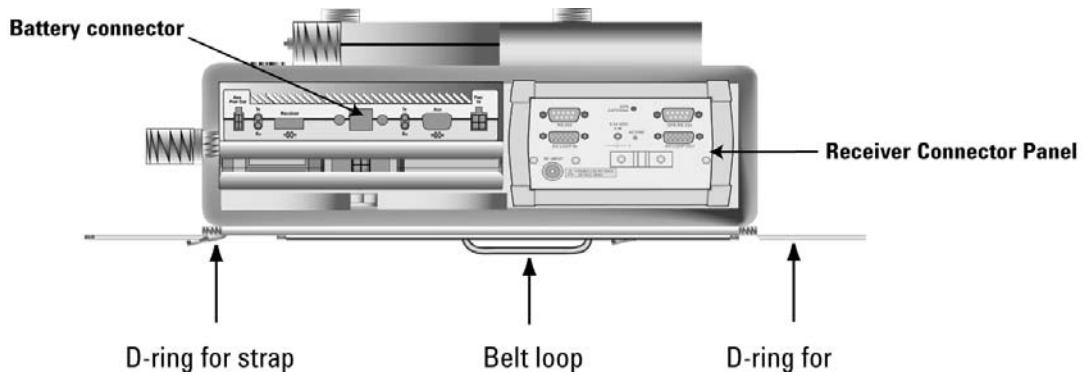
Figure 31   Single receiver backpack (left side view)

Using the Single-Receiver Backpack

1 Adjust the waist belt for a snug fit around your waist, then remove it.

2 Feed the waist belt through the belt loops of the pack. The black mesh should be on the outside.

3 Connect the two shoulder straps to the D-rings of the pack.

4 Mount the pack to your body, then connect the buckle of the waist strap.

5 Adjust the shoulder straps.

6 Connect the chest strap to the D-rings of the shoulder straps.

7 Adjust all straps for a comfortable fit.

Portable Dual E645xx Receiver System

This section describes the cable connections for a system equipped with two E645xx receivers. This configuration is housed in the dual receiver back pack hub kit, E6473B option 024. The backpack contains a removable mounting platform to which the receivers and Direct Connect Hub are attached.

The dual receiver backpack hub kit also supports a two-direct connect hub (no receivers) configuration. To achieve this configuration, you must purchase two Agilent High Speed Direct Connect Hub (E6473B option 015), one dual receiver backpack hub kit (E6473B-024), and one carry pack hub kit (E6473B option 022). The carry pack hub kit is required for the portable chassis and the battery kit, which would be used for the second direct connect hub. Please note that the carry pack, itself, can be strapped into the backpack.

> **NOTE**
>
> Please refer to Appendix D, "System Information", for antenna and phone interface cable part numbers.

Direct Connect Hub Chassis Assembly

The Direct Connect Hub and the battery are attached to a metal chassis. Refer to Figure 32 and Figure 33 for Direct Connect Hub and battery orientation.
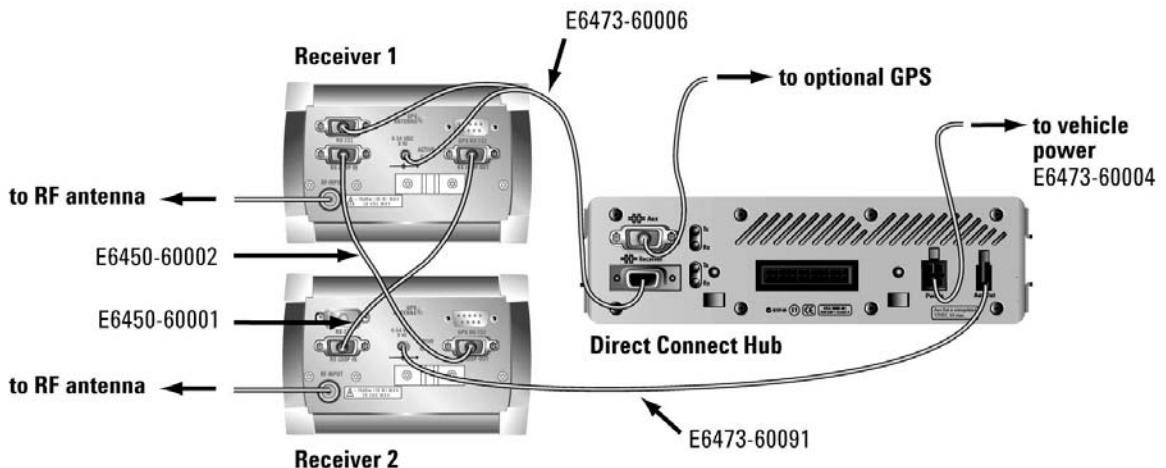
Figure 32   Data and power connections

E6473-60010   **Direct Connect Hub**

USB port

Plug USB software
license key into this
port, if programmed.
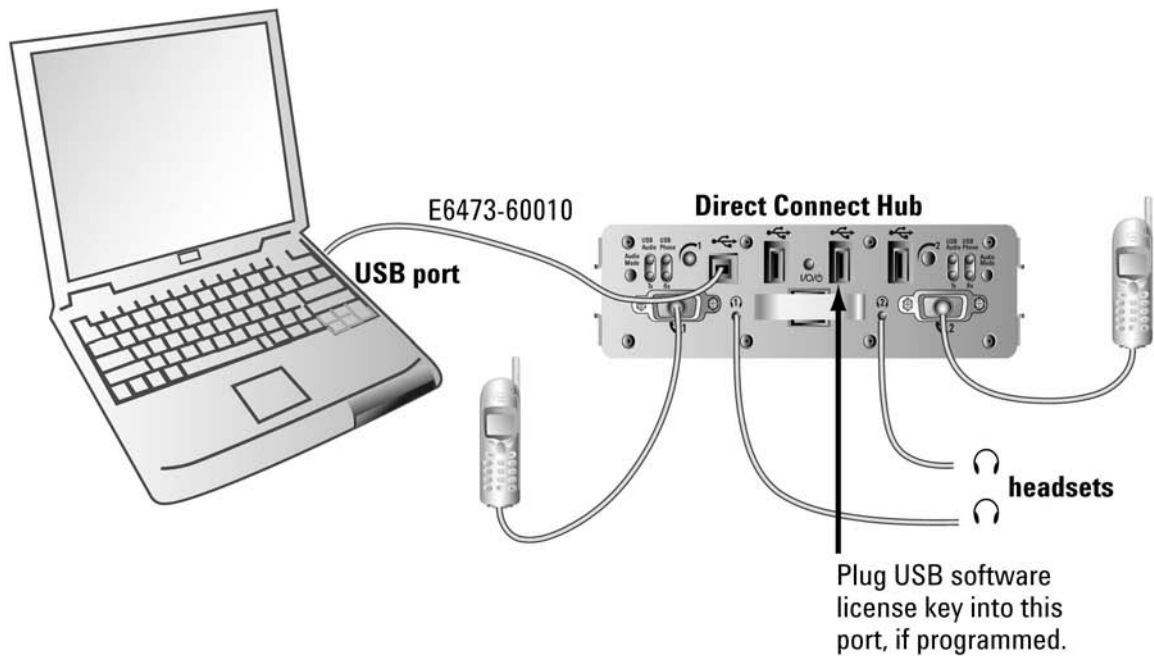
Figure 33   Peripheral connections

1 Rotate the locking knobs horizontally to allow devices to
slide into the slots of the chassis.

2 Insert the battery into the bottom slot of the chassis.

3 Rotate the locking knobs to a vertical position, and tighten
the screws.

NOTE   The battery is keyed, and can only be properly inserted into the chassis
when the connectors are aligned.

Cable Routing Within the Backpack

Refer to Figure 34 for cable routing details. Refer to Appendix D, System Information, for antenna, phone, and headset cable part numbers.

1 Route the receiver and GPS antenna cables through the two openings in the cover.

2 Route the phone cables through the appropriate opening, depending on where the phones will be attached.

3 Route the USB cable (E6473-60005) and headset cables through the top opening.

Pocket for manual

Route receiver and GPS antenna cables through these openings. Route the phone cables through these openings, if phones are in the pouches, attached to a side loop, or attached to the waist belt.

Route the USB and headset cables through this opening. Route phone cables through this opening, if phones are attached to the shoulder straps.

Pocket for cable connection card

Figure 34   Inside the backpack

Cable Routing Through the Shoulder Straps

Refer to Figure 35 for a cable routing example.

1 Route the USB cable (E6473-60005) through either shoulder strap.

2 If the phones will be attached to the shoulder straps, route the phone interface cables through either shoulder strap.
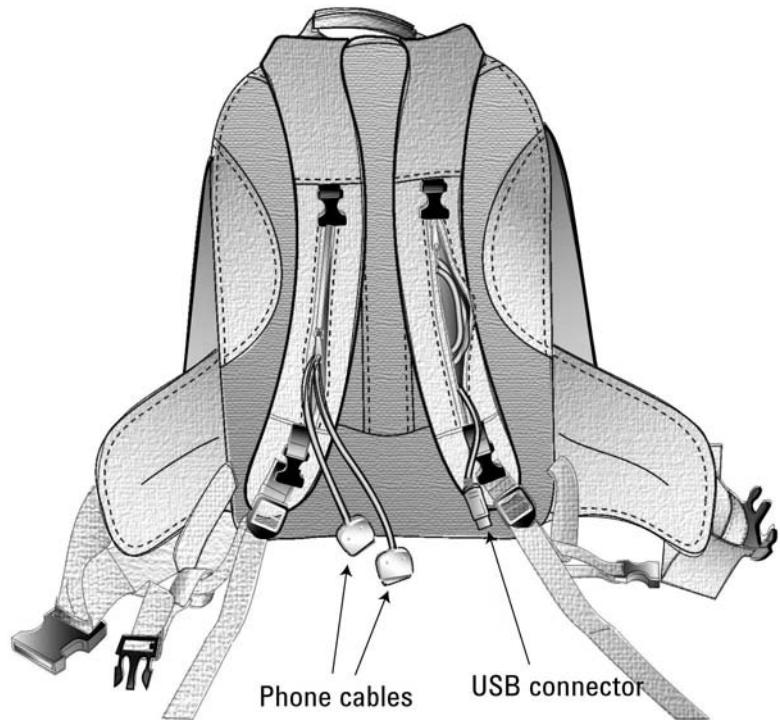
Figure 35   Routing cables through the shoulder straps

Receiver and Hub Mounting

Refer to Figure 36 on page 78 for receiver and Direct Connect Hub mounting positions. Use the straps provided to secure the components to the platform.

1 Remove the inner component platform from the backpack.

2 Attach the E645xx receivers to the platform.

3 Attach the Direct Connect Hub/battery/chassis assembly to the platform.
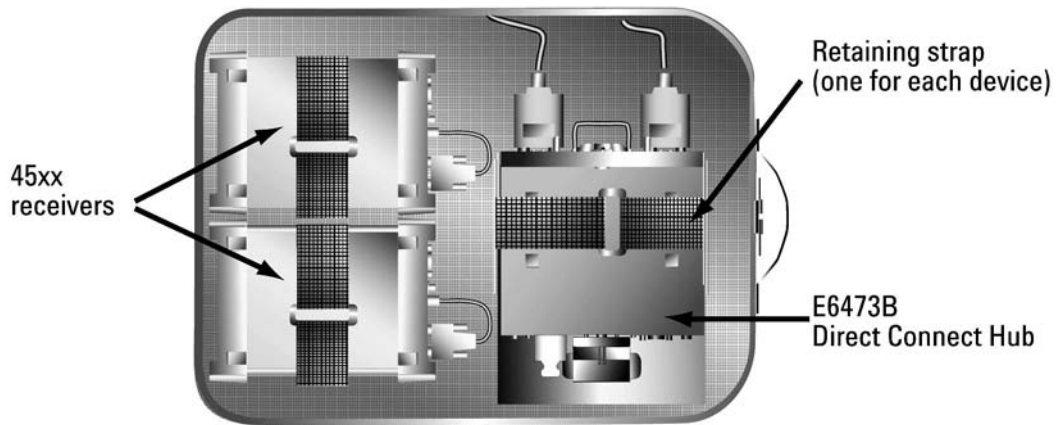
Figure 36   Two receivers and Direct Connect Hub mounted to the platform

Cable Connections to the E6473B High Speed Direct Connect Hub

1 Connect the receiver data/power cable (E6473-60106) to the
⎓ RECEIVER port on the rear panel.

2 Connect the second receiver power cable (E6473-60107) to
the AUX PWR OUT connector.

3 If programmed, insert the software license key into the ⟜
(USB Downstream) port on the front panel. Otherwise, plug
the DB25 key into the parallel port of the computer.

4 Connect the USB cable (E6473-60005) to the ⟜ (USB
Upstream) port on the front panel.

Cable Connections to the E645xx Receiver

1 Connect the D-shell connector end of the receiver
data/power cable (E6473-60106) to the RS-232 port of
Receiver 1.

2 Connect the power plug of the receiver data/power cable to
the 9-34 VDC connector of Receiver 1.

3 Connect the power plug of the second receiver power cable
(E6473-60107) to the 9-34 VDC connector of Receiver 2.

4 Connect the short RX Loop cable (E7450-60001) to the RX LOOP IN port of Receiver 1.

5 Connect the opposite end of the cable to the RX LOOP OUT port of Receiver 2.

6 Connect the long RX Loop cable (E7450-60002) to the RX LOOP IN port of Receiver 2.

7 Connect the opposite end of the cable to the RX LOOP OUT port of Receiver 1.

8 Connect the receiver antennas to the RF INPUT connectors of the receivers.

9 If equipped, connect the GPS antennas to the GPS ANTENNA connectors of the receivers.

Dual Receiver Backpack Final Assembly

1 Place the component platform inside the backpack, as shown in Figure 36 on page 78. It attaches to the backpack with Velcro fasteners.

2 Connect one phone interface cable to the 📞*1* (Phone 1) port of the Direct Connect Hub.

3 Connect the second phone interface cable to the 📞*2* (Phone 2) port of the Direct Connect Hub.

4 Connect the headset cables (E6473-60017) to the connectors of the Direct Connect Hub.

5 Attach the clip-on receiver antennas to the antenna loops on the sides of the backpack. See Figure 37.

Phone pouches

Loops for antenna clips

Carry handle
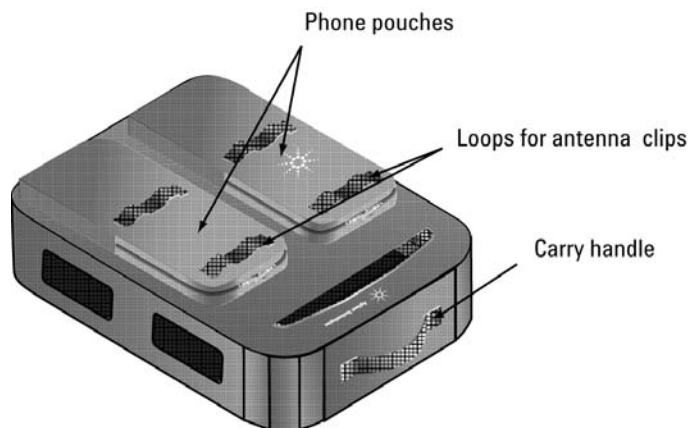
Figure 37   Backpack exterior features

6 Close all zips.

CAUTION	To prevent damage to the Direct Connect Hub or phone, always power the Direct Connect Hub **off** before connecting or disconnecting a phone.

7 With the Direct Connect Hub powered off, connect each phone to its interface cable.

8 Attach the phones to the shoulder straps, antenna loops on the side of the backpack, or in the phone pouches.

9 Connect the free end of the USB cable to the USB port of the computer.

Adjusting the Backpack Harness

1 Loosen all straps and place the pack on your back as shown
   in Figure 38.

Figure 38   Tightening the shoulder straps on the backpack

2 Fasten the waist belt and tighten it so that it rests on your
   hips. The waist belt should always remain on your hips, even
   after the harness is adjusted.

3 Tighten up the shoulder straps until the pack feels
   comfortable. The weight of the pack should be carried on
   your hips for maximum comfort. The shoulder straps help
   stabilize the pack on your body.

4 Connect the chest strap. You can change the vertical position
   so that the strap fits comfortably across your chest. The
   sternum strap reduces shoulder fatigue and increases
   mobility by pulling the shoulder straps inward.

Phone Connections

The phone cable set includes a 3 foot (approx. 1 meter) phone
interface cable, a 15 foot (approx. 4.5 meter) extender cable
(E6473-60042), and a 9-to-26 pin adapter, that allows the phone

cable to be plugged into a Serial port of the computer for a "direct connect" configuration (See "Computer Serial Port Connections" on page 57.).

Direct Connect Hub Connection

CAUTION	To prevent damage to the Direct Connect Hub or phone, always power the Direct Connect Hub off before connecting or disconnecting a phone.

1 Connect the phone interface cable(s) to the phone(s).

2 Connect the opposite end of the phone interface cable to the ✆1 (Phone 1) port of the Direct Connect Hub.

3 Connect the opposite end of the second phone interface cable to the ✆2 (Phone 2) port of the Direct Connect Hub.

4 Connect the headsets (E6473-60017) to the headset connectors of the Direct Connect Hub.

Computer Serial Port Connection

If your system is equipped with two or more phones and does not include an E6473B High Speed Direct Connect Hub, install the Dual Serial Port PCMCIA card per the manufacturer's instructions.

1 Connect the phone interface cable to the phone.

2 If you are using the extender cable (E6473-60042), connect it to the phone interface cable.

3 Connect the 26 pin end of the 9-to-26 pin adapter (E6473-60015) to the phone interface cable (or extender cable).

4 Connect the 9 pin end of the adapter to the Serial port of the computer.

NOTE	Phone battery charging and audio monitoring are not supported with direct connect phones.

Using Portable Components in a Vehicle

If you plan to use the system within a vehicle, remove the Direct Connect Hub (and scanner, if equipped) from the metal chassis before connecting the in-vehicle power cable to the Direct Connect Hub. See "In-Vehicle System Set Up" on page 31 for details.

Battery Use and Care

Checking the Remaining Charge

Press the test button shown in Figure 39 to check the remaining charge capacity. The battery charge level can be checked while the Direct Connect Hub power switch is on or off, however checking it with the power on may provide a more accurate indication.

LEDs Lit	Capacity Remaining
5	81% to 100%
4	61% to 80%
3	41% to 60%
2	21% to 40%
1	1% to 20%
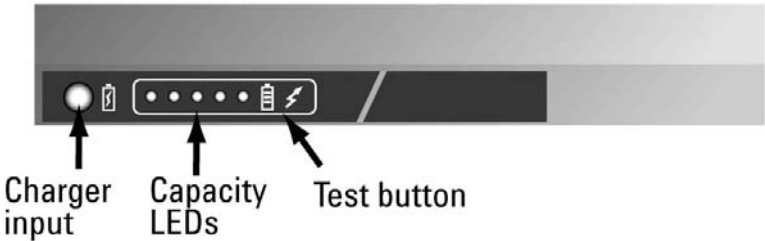
Figure 39   Lithium-ion battery

Charging the Battery

The battery (86156A-520) can be charged within the carry bag. Disconnect the charger from the battery before checking the charge. The battery is fully charged when all five LEDs are lit.

WARNING   **Never charge the battery when the E6473B High Speed Direct Connect Hub is powered on. Use only the approved charger, part no. E6473-60009.**

1 Connect the battery charger cable to the battery.

2 Plug the battery charger's AC power cord into a 100-240V AC 50-60 Hz power source.

3 Allow approximately three hours to fully charge the battery.

Using Vehicle Power

See "In-Vehicle System Set Up" on page 31 for power cable installation and connection instructions.

Safe Handling and Disposal

For the safe use of lithium-ion batteries, always follow the instructions provided below. Improper handling of lithium-ion batteries may result in injury or damage from electrolyte leakage, heating, ignition, or explosion. Batteries must be recycled or disposed of properly.

WARNING   **Always use the battery charger provided with the battery.**

Never heat or incinerate the battery.

Never impact, pierce, or crush the battery.

Never disassemble or modify the battery. The battery contains a circuit designed to enhance safety. Damaging this circuit may cause overheating, fire or bursting.

Never charge a battery under high temperature conditions, such as near a fire or in the direct sunlight. If the ambient temperature is too high, the protection circuit may be actuated, preventing further charging, or damage.

Never short-circuit the battery by connecting the positive and negative terminals with a metal material.

Do not store or carry the battery where it could come into contact with metal objects such as a key chain or necklace.

Never allow the battery to get wet or be immersed in water.

Do not place the battery in a microwave oven or high-pressure container.

Stop charging if the battery is not charged after the prescribed charge time.

If leakage of the electrolyte occurs, or if there is an offensive odor, keep the battery away from any source of fire or spark.

If you become aware of any abnormal phenomena, such as odor, discoloration, or deformation, during use, while charging, or when storing the battery, remove the battery from the device or charger and stop using.

In the event the electrolyte comes into contact with the eyes, flush thoroughly with clean water, without rubbing. Consult with a physician immediately.
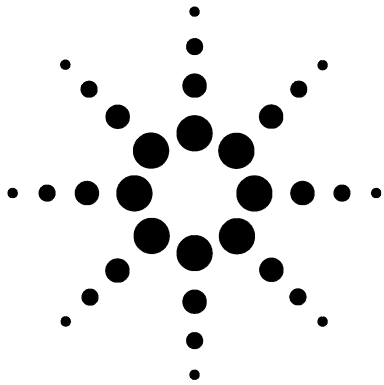
4
Use Your System

To do this	See this
Turn on power to the system components.	"Turning the Power On" on page 88
Start the system.	"Starting the Software" on page 93
Verify the system.	"Verifying the System" on page 105

Turning the Power On

Battery Charging

- For a portable system, verify that the Direct Connect Hub, phone, and computer batteries are fully charged before beginning a survey. Refer to "Battery Use and Care" on page 84 for more information.

- For an in-vehicle system, verify that the phone batteries are fully charged before beginning a survey.

E6473B High Speed Direct Connect Hub

The Direct Connect Hub has a three-position power switch. It controls the power to the Hub, the phones, and the scanner or receivers. The blue LED above the power switch will glow after the Direct Connect Hub has initialized.

- Place the switch in the left position to power the unit on. For in-vehicle systems, if the Direct Connect Hub is powered on and off by an GPS/DR navigator unit, the switch should be in the left position.

- Place the switch in the center position to power the unit off.

- For in-vehicle systems without GPS/DR navigator, placing the switch in the right position allows the unit to power on and off via the vehicle's ignition switch.

NOTE   To allow the receiver to lock onto the GPS signal, allow the system to be powered on at least 3 minutes before starting a data collection test.

Agilent Direct Connect GPS/DR

If the ignition sense lead of the main power cable has been connected to a +12 volt source, the navigator powers up when the vehicle's ignition is switched on and the power switch is in either the Ignition (right) or Power (left) position. (For installation instructions, Appendix E, "Permanent In-Vehicle Hardware Installation," starting on page 207.)

LEDs and Display During Power-up

The upper front panel LED indicates Power, and and the lower LED indicates 1PPS (Pulse Per Second). The information shown on these two LEDs comes from the GPS receiver. One use of the 1PPS would be to indicate that the GPS receiver is active. 1PPS is also available at pin 9 of the rear panel RS-232 DB9 connector and is enabled by software..

The Agilent direct connect GPS/DR status LCD displays power-up and navigation status messages. The front panel LEDs indicate CPU status, speed pulse status, and serial port activity.

Determining GPS Receiver Status

You can determine whether the GPS Receiver is ready to navigate by using the E6474A software as follows:

1 Start the E6474A software, and select **Tools > Navigation** to display the Navigation dialog box.

2 Click the **Live Mode** button.

3 When the GPS Navigator is ready to track, the **Satellites** box shows the number of satellites tracked, and the **Navigation** display shows either 2D or 3D, with the GPS Status displaying "Tracking." Both speed and direction are also displayed. If the Nav Mode shows 3D, the altitude readings in the display are also valid.

Before starting a data collection test, allow three minutes for the unit to acquire GPS position data. During a data collection test, navigation data is also combined and collected.

Calibration of Dead Reckoning

The Dead Reckoning calibration system is virtually self-calibrating and requires minimal user intervention. Once the Agilent direct connect GPS/DR is properly connected and the unit is powered on for the first time, it is not yet calibrated and operates as a normal GPS receiver.

Once navigation begins using GPS signals, the receiver automatically calibrates the sensors. During this calibration process, the vehicle must be maneuvered in a specific manner in order for the unit to calibrate, as follows:

1 Stop the vehicle for at least three seconds in order to determine the gyro bias.

2 Drive in a straight line for a distance of approximately one kilometer (0.62 mile)**.**

3 Turn the vehicle, and proceed in another straight line for approximately one kilometer (0.62 mile).

The period of time and distance traveled that are required for the system to calibrate the Dead Reckoning sensors vary depending on the GPS signal quality and receiver temperature stability. The calibration continuously refines itself as you drive.

Phones

Toshiba Direct-Connect Phone Power-up

Toshiba JCDMA phones have special power-up procedures. Each time you power up the system, you must perform the following procedure to enable communication between the phone and the data collection software. Begin all of the following procedures with the phone and computer powered **off**.

Toshiba 10-CT

1 Unplug the phone interface cable from the phone.

2 Power the computer on.

3 Power the phone on.

4 Plug the interface cable into the phone.

Toshiba C-103T

1 Unplug the interface cable from the phone.

2 Plug the phone interface cable into the phone. The phone will power up.

3 Within the next 5 seconds, press the following keys on the handset: **# 3 2 5 7 4 7 *** (Numbers will appear on the display.)

4 Press the **#** key.

5 Press the following keys: **F 9 6** (The F key is to the right of the toggle button.)

6 Press the **F** key.

7 Choose the **DIAGE** option.

8 Press the **F** key.

9 Power the computer on.

Toshiba 301T

1 Unplug the interface cable from the phone.

2 Plug the phone interface cable into the phone. The phone will power up.

3 Press the following keys: **F 9 0** (The F key is to the right of the toggle button.)

4 Press the **F** key.

5 Choose the upper **DIAGE** option. (Do not choose the DIAGE AUX option)

6 Press the **F** key.

7 Power the computer on.

iDEN® i1000 Plus Baud Rate

The following procedure sets the phone to communicate at 19200 baud:

1 Power up the phone. Wait for "Phone Ready" to be displayed.

2 Press the MENU key 3 times.

3 Press the key under PRGM shown in the display. The Programming Menu is displayed.

4 Press the key under **OK** in the display.

5 Press the right arrow key until SET BAUD RATE: <value> is displayed.

6 Press the key under OK in the display.

7 Press the right arrow key until 19200 is displayed.

8 Press the key under OK in the display.

9 Press the key under EXIT in the display.

Starting the Software

Detailed information about the software is available from the online help. It is assumed that the software has already been installed. If not, refer to "Installing the Agilent E6474A Software" on page 23 for installation instructions.

Before you begin to collect or monitor data, you must:

- Start the application
- Create a plan file
- Identify and enable the devices
- Configure the devices and the display
- Save the configuration

To start the application

1 To start the application, click **Start > Programs > Agilent Wireless Solutions > E6474A > E6474A**.

2 Press **F5** to display the System Setup view.

3 Perform the procedure in "Identifying the Devices" on page 94.

Creating Plan Files

An .spf file is a plan file that contains the system device configuration, the properties settings for all of the devices, and the views, as they have been configured and arranged in the main window. Its name appears in the title bar of the main window. You can create different .spf files with unique characteristics for specific test routes.

- To create a new .spf file, click **File > New**. A new System Setup view opens.

You can also open and modify an existing .spf plan file, saving it with a different name.

If an .spf file is not open when you start the E6474A software, you need to create one. You must also create a new one if you have used the system, disconnected devices, and then reconnected them to different COM ports than those to which they were originally connected.

> **NOTE**　The E6474A software is shipped with a set of default and demo plan files for each technology. These files can help you to see how .spf files are set up and used. For information on how to locate these files and what each file contains, refer to the online help, where you can use the help index to locate **Default Plan Files** or **Demo Plan Files**.

Identifying the Devices

The software must identify the system devices before it can communicate with them. System devices include the phones, the E645xx receivers or E746xx scanner, and the navigator (if equipped). This process is also referred to as "configuring the system."

> **NOTE**　Generic data devices are configured differently than phones used in conversation mode. See "Generic Data Devices" on page 99 for setup information.

System Setup View

The System Setup view is used for identifying the devices. Before identifying the devices, it appears as shown in Figure 40, through Figure 42. After identifying the devices, it displays a tree diagram of the system configuration, showing the computer COM ports and the devices connected to them, as shown in Figure 3. The following example shows how to identify a phone attached to the COM1 port.

NOTE	If you are uncertain about how COM ports are assigned and need assistance in determining which COM port is assigned to each specific device, refer to *Important Information About the E6473B Agilent High Speed Direct Connect Hub.* The section entitled, "Understanding and Organizing COM Ports" provides detailed information that will help you to identify and set up COM ports.

This document is shipped with the E6473B system, and the latest version is also available at http://www.agilent.com/cm/wireless/e6474/download.shtml.

Phone Connected to a Computer Serial Port

A typical System Setup view before the devices have been identified is shown in Figure 40. The phone is connected to the computer's COM1 port.

Procedure – Identify Devices

To identify the devices, perform the following procedure. All system components should be connected and powered on.

1 Right-click on **COM1** in the System Setup view. A popup menu appears, as shown in Figure 40
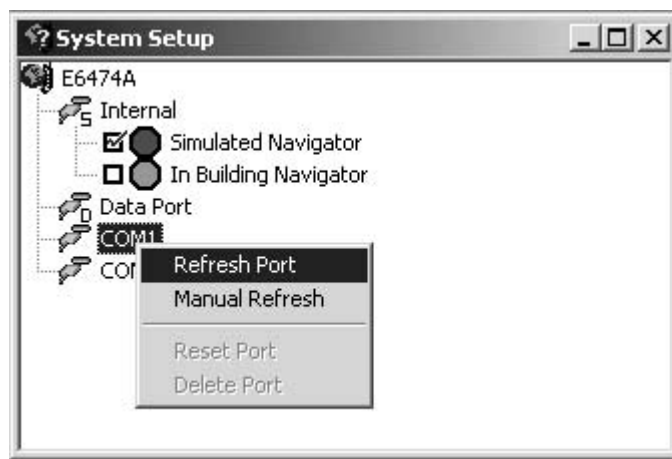
Figure 40   System setup view showing pop-up menu

<table>
<tr><td>**NOTE**</td><td>Effective with release 5.0 of the E6474A software, the System Setup view displays device identification information whenever the E6473A or E6473B hubs are connected. You can now see at a glance which COM ports are assigned to each type of device, and you can even identify those for E6473A versus E6473B. You can also differentiate the functionality of each COM port.</td></tr>
</table>

2 Click the **Refresh Port** command. After approximately 30 seconds, the device is identified, and a message appears telling you that you can click **Yes** if you want to update the Comm port, click **No** if you do not want to update the Comm port, or click **Details>>** to view the devices found on the Comm port.

NOTE   If you are sure which device is connected to the selected port, you can reduce refresh time by using the **Manual Refresh** option. A second menu is displayed showing the devices you are currently licensed to use. You can then select the device that is connected to the selected port.

3 Click the **Detail** button to show more information about the device that was detected.

4 Click the **Yes** button to accept the configuration. Figure 41 shows an example.

Figure 41   Single direct connect phone identified on computer COM port

NOTE   When using a dual serial port PCMCIA card (PC card) take a note of which COM port is assigned to which device.

Enabling the Devices

Note that the check box next to each device is checked, indicating that the device is enabled for data collection. Phones, receivers, and scanners are automatically enabled after you

accept the results of the Refresh Port action. The navigator, however is not automatically enabled. Before you begin logging data or Live Mode, verify the following:

- Verify that each phone, scanner, or receiver is enabled. Click the check box to enable the NMEA Navigator. The navigator supplies data to plot your position on the Route Map.

- Click the check box to enable the In-Building Navigator if you have E6474A, option 030, indoor mapping. This allows you to use the In-Building Route Map for manually plotting your test route.

- Click the check box to enable the Simulated Navigator when you need to isolate a problem, and do not require real navigation data.

System with an E6473B High Speed Direct Connect Hub

If your system is equipped with an E6473B High Speed Direct Connect Hub, you must:

1 Connect the phones to the Phone ports.

2 Power the Direct Connect hub **On**.

3 Have the E6473B driver software already installed. For the E6473B driver installation procedure, refer to document E6473B-90067, *Important Information About the E6473B Agilent High Speed Direct Connect Hub.* This document is shipped with the E6473B system, and the latest version is also available at http://www.agilent.com/cm/wireless/e6474/download.shtml.,

NOTE   Make a note of the COM ports to which the data devices are connected. If you are unfamiliar with how COM ports are assigned, refer to document E6473B-90067. The section entitled, "Understanding and Organizing COM Ports" details how COM ports are assigned in Windows systems.

Limitations of the E6473B High Speed Direct Connect Hub

The following are limitations of the Direct Connect Hub, when a dual port data phone such as a Sagem OT96, Samsung X100, Samsung X1200 Samsung A399, or Kyocera 2235 phone is connected to it:

- When the phone is connected to the Phone 1 port, the Aux port cannot be used.
- When the phone is connected to the Phone 2 port, the Receiver port cannot be used.
- In order to measure data/trace parameters, two ports must be used.

Generic Data Devices

Before using the Agilent E6474A software to make data measurements, it is important that you configure the external software and hardware. This software and hardware is used to establish a data connection through your phone, with the phone acting as a wireless modem. The following sections outline the tasks you need to perform before you start the Agilent E6474A software.

For more information, refer to:

- Phone supplier's documentation or software
- Windows Dial Up Networking installation wizard help
- Agilent E6474A online help and tutorial

Configure the Phone

Each phone is supplied with manufacturer's documentation that explains how to configure a phone for use as a modem (data device). Using this documentation set up the phone's modem settings by navigating through the phone menu options and entering the modem interface settings.

Add a Modem Connection to the Computer

Instructions for adding a modem connection to the computer and configuring it are included with the phone's documentation. Follow the instructions explicitly.

NOTE	In the dialog box that prompts "Do you want Windows to detect your modem?" be sure to check the "Don't detect my modem; I will select it from a list" check box option. You will also be prompted to select a COM port on which to install the modem. For this prompt, select the COM port to which the data device is connected.

Configure the Network and Dial-up Connection

Instructions for configuring the Network and Dial-up Connection are included with the phone's documentation. Follow the instructions explicitly. There are two parts to this procedure:

- **Setting up the Internet Connection:** In this part of the procedure, you set up the dial-up connection to your service provider. You need your service provider's phone number.

- **Advanced Connection Properties:** In this part of the procedure, you set up the **Dial Up Networking** (DUN) properties, including the DNS and APN settings for your ISP. This information is available from your service provider.

NOTE	It is recommended that you use a logical (and meaningful) name for the DUN connection name. You will select this as the Dial-up Name when you configure the Data Port Properties in the E6474A software. For example, include the phone type, service provider name, and Data Port connection number: Sagem-MyProvider-COM3.

Testing the Phone/Modem Configuration

The following test verifies that all phone and modem settings are correct:

1 Using the Dial-up Connection you have set up, establish a connection with the Internet.

NOTE	Not all phones have integrated data and power supply connections. Ensure the phone is fully charged before proceeding. Connect the phone to a serial port of the computer, using the recommended connections given to you by the phone supplier.

2 Open the browser on the computer.

3 Attempt to browse the WEB.

4 If this test is successful, then start the E6474A software, and proceed to Adding a Data Device.

Adding a Data Device

Use the Data Port in the System Setup view to set up the device and data properties. In the System Setup view, up to four Devices can be added to the Data Port. Properties for the data device can then be configured, in a manner similar to a phone.

To add a device to the Data Port:

1 Right-click on the Data Port. A pop-up menu appears, as shown in Figure 42.
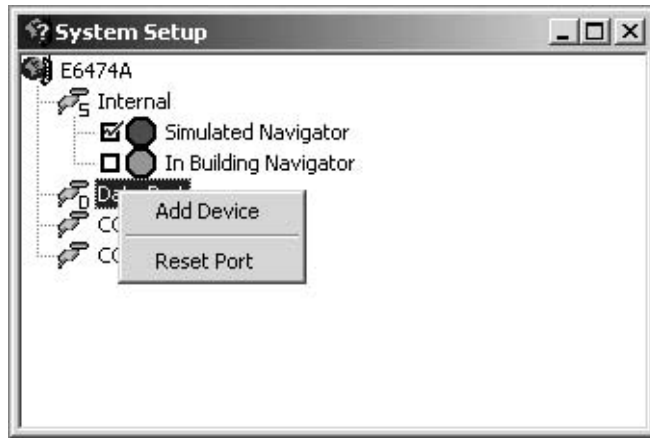
Figure 42 Adding a data device

2 Choose **Add Device** from the pop-up menu. After you add the Data Device, it is enabled, as indicated by the check mark next to Data Device in Figure 43.
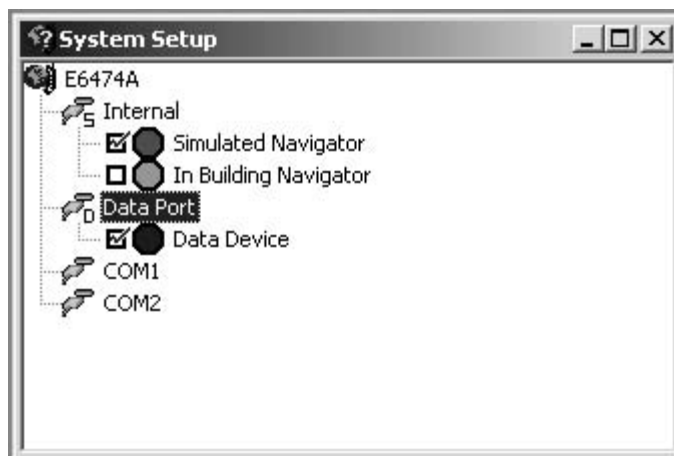
Figure 43   Data device added

Configuring Data Device Properties

To perform throughput and timing calculations, you should use Agilent Data Server Software. For more information on this software and how it works, refer to the Agilent Data Server software installation guide (E7475-90012).

Before you can perform a test with the data server, you must configure the properties of the Data Devices added to the Data Port. The Properties dialog box for the Data Device allows you to configure the test conditions and parameters. See "Configuring the Devices" on page 103 for instructions on opening this dialog box.

NOTE	Although the Agilent E6474A software shows the COM port in the System Setup view that the data device is connected to, that COM port cannot be used for configuring the device's properties. Data Device properties can only be configured by right-clicking on the **Data Device**, then choosing **Properties** from the pop-up menu.

Saving the Configuration

1 Click **File > Save**. The Save As dialog box opens.

2 Enter a file name.

3 Click the **Save** button to save the configuration. It is saved as an .spf file.

Configuring the Devices

Properties

Each phone, scanner and receiver is configured via its Properties dialog box. The Properties dialog box contains tabbed pages with related test options, such as the phone number to automatically dial, call duration, call setup time, messages to collect, and for scanners and receivers, channels to scan.

To configure a device:

1 Within the System Setup view, right-click on the text for the phone, scanner, receiver, or Data Device to show the popup menu,

2 Click **Properties...** The Properties dialog box for the device opens.

NOTE	It is recommended that you also use the **Edit Label** command on the pop-up menu, to give the device a meaningful name. For Data Devices, it is helpful if the label includes the COM port that the device is connected to. The label will appear in the title bar of the views associated with the device.

3 Enter the appropriate information to configure the device. Press the **F1** key or click the **Help** button on each tabbed page of a Properties dialog box to display the Help topic with detailed information about the options, check boxes, and text boxes.

4 Repeat the process to configure each phone, scanner, receiver, or Data Device before you begin a test.

5 After you configure all of the devices, click **File > Save**. The options you have selected are saved in the .spf file that is currently open.

6 Close, then restart the E6474A software. The .spf file that was open for the last session reopens, with the options saved.

Configuring the Display

Standard Views

Many standard views (windows) are available for each device. The views display the data you collect during a test. (A data file from a test can also be played back and displayed.).

Examples of the phone views include Phone Status, which displays signal parameters, and Layer 3 messages. Examples of scanner views include the Scanner Chart, which shows signal strength as text, and Scanner, which shows signal strength as a graph for all of the channels selected.

Open each view by selecting it from the View menu, keeping in mind the amount of screen space available. Views can also be open and minimized to save space. For information on the view, select it, then press the **F1** key.

Receiver Views

Views of receiver measurements are displayed in the View Menu and on the title bars of the views with the measurement name preceded by the device identifier. For example, the Base Station Spectrum Analyzer measurement is displayed in a view as the E64xx_*measurement ID*_Base Stattion Spectrum Analyzer, as shown in Figure 44 on page 105. The device identifier helps to instantly identify it as a receiver view.
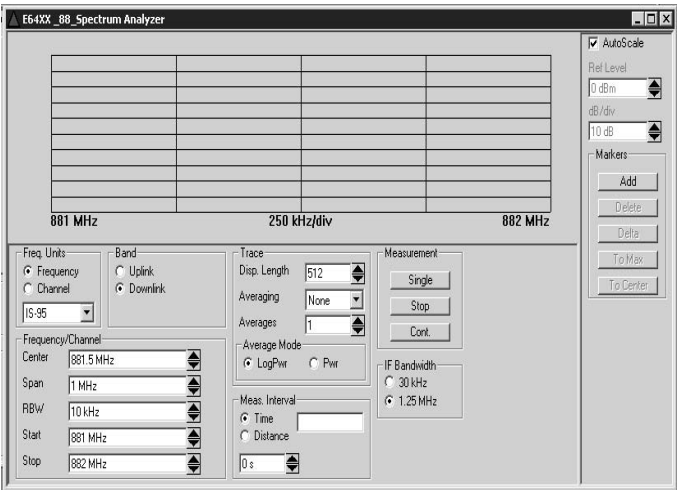
Figure 44 A typical receiver view.

When you create a receiver measurement while editing receiver properties, the view does not automatically display; however, you can open the view at any time by using the View menu.

Note that, when you open a receiver view, you automatically create a measurement if one has not already been created.

Verifying the System

Overview

There are seven tests you can use to verify your system, as listed in Table 2 on page 106.

Table 2   Methods to verify your system

Test Description and Page
"Test 1 - Receiver Testing Using a Signal Generator" on page 106
"Test 2 - Receiver Testing by Measuring a Known Channel" on page 112
"Test 3 - Receiver Testing by Measuring the Noise Floor" on page 114
"Test 4 - GPS Receiver Testing" on page 117
"Test 5 - High Speed Scanner Testing by Measuring Known Channels" on page 118
"Test 6 - High Speed Scanner Testing Using a Signal Generator" on page 118
"Test 7 - Phone Testing Using a Test Call" on page 120

- If your system includes an Agilent digital receiver, perform tests 1, 2, or 3 and test 4. Tests 1 and 2 provide the highest level of confidence. Teest 3 should only be used for testing the receiver if you do not have a signal generator and there is no known channel in the system.

- If your system includes an E746xx scanner, perform test 5 or 6.

- If your system includes a phone, perform test 7.

NOTE   The verification tests are only used to alert you to possible non-operating conditions. To measure actual receiver specifications, the unit must be measured in a controlled environment, using Agilent Technologies' prescribed measurement techniques.

Test 1 - Receiver Testing Using a Signal Generator

Preparing the Hardware

1 Connect the system as shown in Figure 45 on page 107, but do not connect the signal generator output. The Agilent

receiver requires a 30-minute warm-up period to meet the guaranteed specifications.

NOTE   There is a three-minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct.
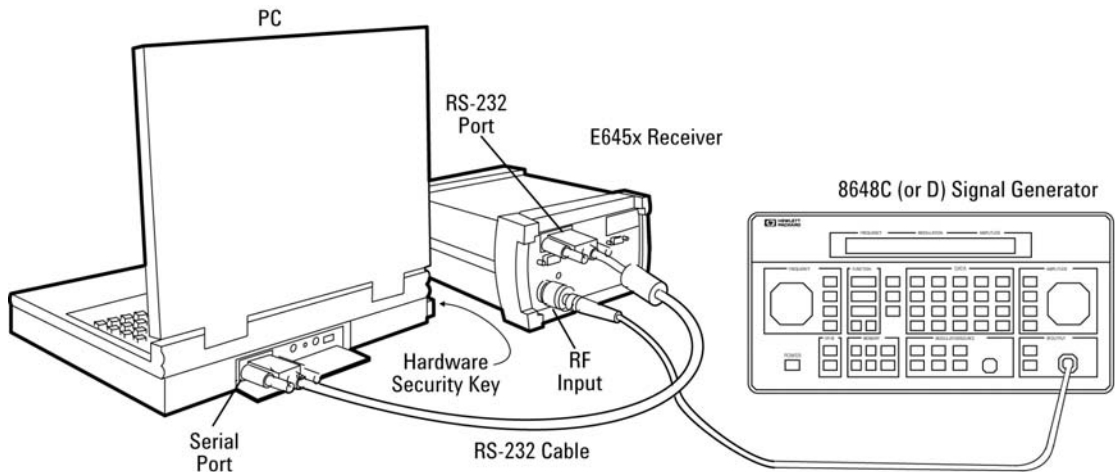
Figure 45   System measurement verification setup using a signal generator

2 Depending on your system type, set the frequency/power levels using "Signal Generator Uplink Settings" on page 108.

3 Verify that the correct values are set on the signal generator.

NOTE   Do not connect the signal generator at this stage.

Table 3   Signal Generator Uplink Settings

Model	Frequency and Power Setting
GSM1900, TDMA, cdma2000 and CDMA PCS band systems	1879 MHz at –60 dBm
GSM DCS1800 band systems	1748 MHz at –60 dBm
GSM900 band systems	898 MHz at –60 dBm
Cellular CDMA and TDMA band systems	837 MHz at -60 dBm
UMTS E6455C receivers	1950 MHz at –60 dBm

Preparing the Software

1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure, if you have not already done so.

3 Click **Log > Start Live Mode**.

4 Open the Spectrum Analyzer view and maximize the view.

5 Connect the signal generator output to the RF input of the receiver.

6 Turn on the signal generator.

7 Set the measurement software as follows:

  Band: Uplink

  Frequency: Refer to Table 3 on page 108.

  Span: 1 MHz

  Averaging: Running

  Averages: 32

You should see a signal trace showing a single spectral peak in the middle of the display, as shown in Figure 46 on page 109.
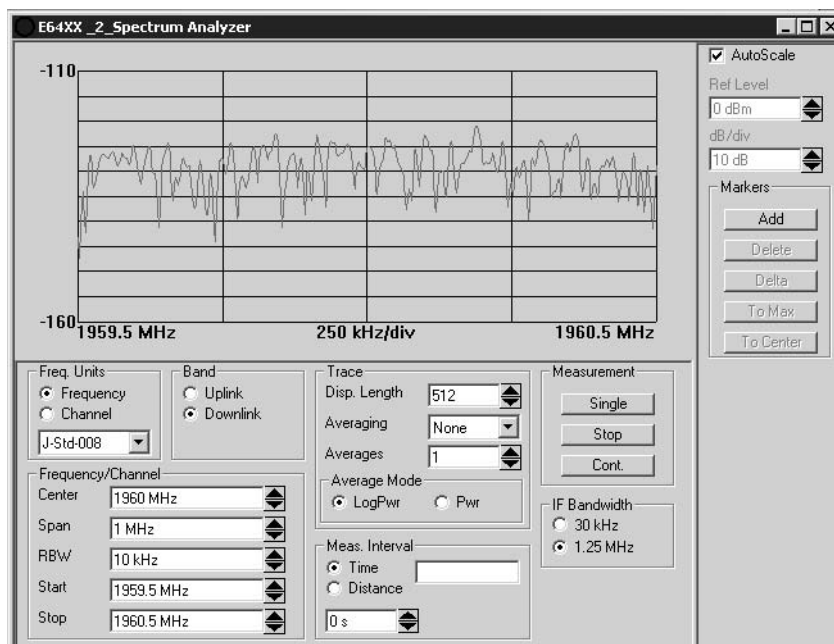
Figure 46 Spectrum Display with Marker Set to a Center Frequency of 1960MHz(CDMA 1900 band system)

Testing the Signal

1 In the Markers group, click **Add** and **To Max**. The level and frequency are displayed at the top-left corner of the Spectrum Analyzer display.

2 In the Band group, select Downlink.

3 In the Freq/Channel group, change the Center frequency according to Table 4 on page 110.

4 On the signal generator, set the frequency according to Table 4 on page 110.

You should see a signal trace showing a single spectral peak in the middle of the display. Figure 47 on page 110 shows an example trace.

Table 4   Signal Generator Downlink Settings

Model	Frequency and Power Setting
GSM1900, TDMA, cdma2000, and CDMA PCS band systems	1959 MHz at -60 dBm
GSM DCS1800 band systems	1843 MHz at -60 dBm
GSM900 band systems	943 MHz at –60 dBm
Cellular CDMA and TDMA band systems	882 MHz at -60 dBm
UMTS E6455C receivers	2140 Mhz at –60 dBm

NOTE   Wait for at least one minute before using the displayed marker value. The default trace display is set to display a running average of 32. With time, the marker value will approach the value of the signal generator output.
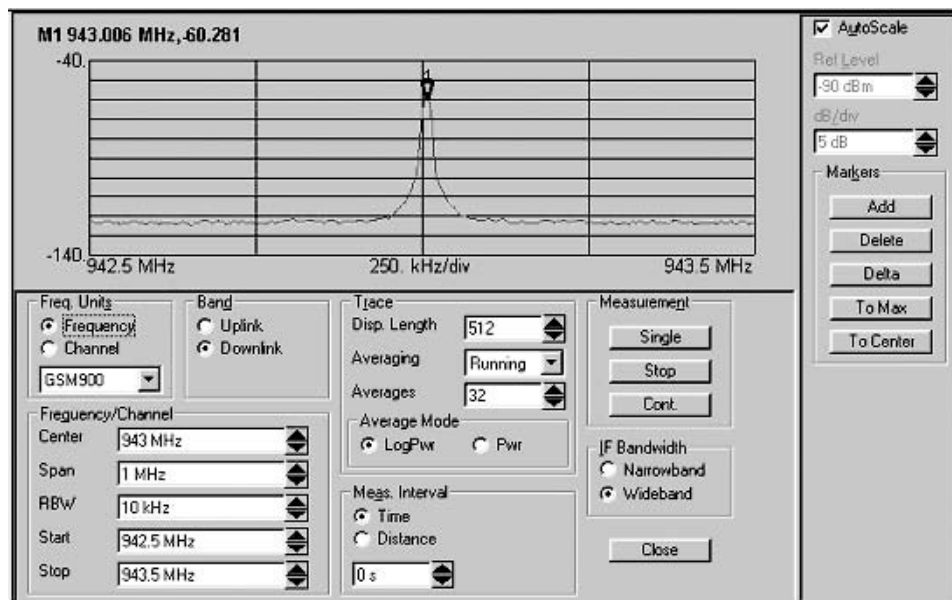
Figure 47   Spectrum Display with Marker Set to a Center Frequency of 943 MHz (GSM 900 band system)

Accuracy

The accuracy is calculated as:

Frequency accuracy = signal generator accuracy + 1 ppm.

Amplitude accuracy = ± (0.5 dB + signal generator accuracy + mismatch error + cable loss).

Assuming the Agilent receiver and Agilent 8648B signal generator specifications, with nominal values of mismatch and cable losses of approximately 1 dB, you can expect:

• Frequency reading, approximately: Frequency selected ±450 kHz

• Amplitude reading, approximately: Amplitude selected ±2.5 dB

NOTE You can save the settings of the project (.spf file) at any time. If you experience measurement or configuration problems, you can refer to the settings shown in the corresponding verification test.

Passing the Test

If the display shows a single spectral peak, and reports frequency and power levels that match the output of the signal generator, the system has passed the test.

If your system is equipped with a navigator, perform the tests in "Test 4 - GPS Receiver Testing" on page 117. If you experience problems in setting up the tests, refer to "Solving Problems with Your System" on page 130.

Test 2 - Receiver Testing by Measuring a Known Channel

Preparing the Hardware

1 Connect the system as shown in Figure 48.
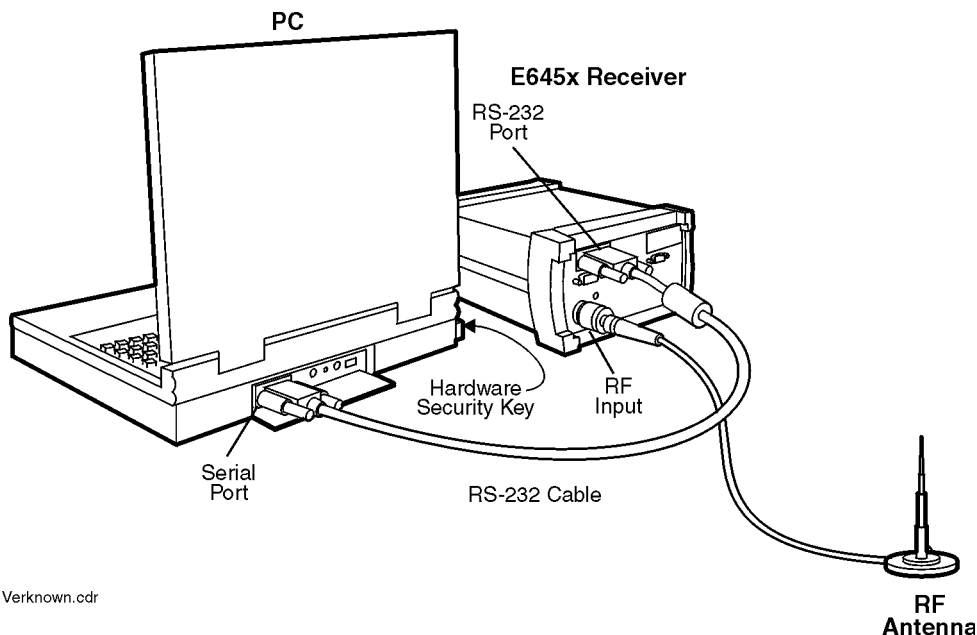
Figure 48   System configuration for measuring a known channel in the system

2 Turn on the Agilent receiver.

NOTE

The Agilent receiver requires a 30-minute warm-up period to meet the guaranteed specifications. There is a three-minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct.

Preparing the Software

1 Start the E6474A software.

2 Refer to"Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 Click **Log > Start Live Mode**.

4 Open the Spectrum Analyzer view and maximize the view.

5 Select either Frequency or Channel in the Frequency Units. Frequency is displayed on the Spectrum Analyzer view.

6 Set the measurement controls as follows:

Band: Downlink

Frequency: User-specified. The frequency you specify and enter in the Center field should be a known communication frequency or channel.

Span: 2 MHz or 1 MHz, depending on the channel used

Averaging: Running

Averages: 32

Testing the Signal

• In the Markers group, click **Add** and **To Max**. The level and frequency are displayed at the top-left corner of the Spectrum Analyzer view.

NOTE	Wait for at least one minute before using the displayed marker value. The system is set to display a running average of 32. With time, the marker value will approach the value of the measured signal.

Passing the Test

If the signal trace is of acceptable amplitude above the noise floor, depending on the distance from transmitters and antenna placement, at the appropriate frequency for the channel measured, the system passed the test.

If your system is equipped with a navigator, perform the tests in Table 5 on page 116 next. If you experience problems in setting up the tests, refer to "Solving Problems with Your System" on page 130.

Test 3 - Receiver Testing by Measuring the Noise Floor

NOTE	Use this procedure only if you do not have a signal generator and there is no known channel in the system. Connect a 50-ohm load (customer supplied) to the input of the receiver.

Preparing the Hardware

1 Connect the system as shown in Figure 49.

Verload.cdr
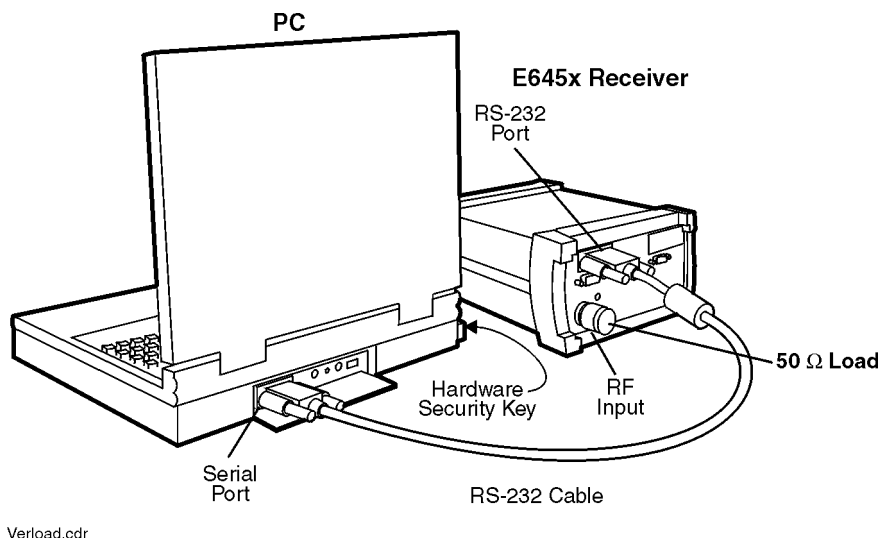
Figure 49   System Configuration for Measuring the Noise Floor

2 Turn on the Agilent receiver.

NOTE	The Agilent receiver requires a 30-minute warm-up period to meet the guaranteed specifications. There is a three-minute delay after power-up or re-configuration, before the internal temperature sensor is activated and measurements are nominally correct.

Preparing the Software

1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 Click **Log > Start Live Mode**.

4 Open the Spectrum Analyzer view and maximize the view.

5 Set the measurement controls as follows:

Band: Downlink

Frequency: See the tables on the next page.

Span: 300 kHz

Averaging: Running

Averages: 100

6 In the Markers group, click **Add** button then **To Max** and note the Marker 1 frequency and level. The level and frequency are displayed at the top-left corner of the Spectrum Analyzer view.

7 In the Markers group, click **Add** to place a second marker on the display.

8 Use the mouse to drag Marker 2 to the minimum level of the trace. Note the Marker 2 frequency and level.

9 Calculate the average noise level of the downlink. Average noise level = (Marker 1 level + Marker 2 level) / 2

10 Select Uplink in the Band group. Frequency is displayed on the Spectrum VFP.

11 Perform steps 7 through step 10 to determine the average noise level of the uplink. Substitute the frequencies from

Table 6 on page 116 in step 6. Average noise level = (Marker 1 level + Marker 2 level) / 2

Table 5   Noise Floor Frequency Settings for Step 6

Model	Marker 1 Frequency (step 6)
PCS CDMA and TDMA band systems	1959 MHz
GSM DCS1800 band systems	1843 MHz
GSM900 band systems	943 MHz
Cellular CDMA and TDMA band systems	882 MHz

Table 6   Noise Floor Frequency Settings for Step 11

Model	Marker 1 Frequency (step 6)
PCS CDMA and TDMA band systems	1879 MHz
GSM DCS1800 band systems	1745 MHz
GSM900 band systems	898 MHz
Cellular CDMA and TDMA band systems	837 MHz

The measurement is making 100 averages, which requires approximately three minutes to stabilize the noise level. After completion, stop the measurement and note the levels.

Passing the Test

You have passed the test if the average noise level is below –122 dBm. If your system is equipped with a navigator, perform the tests in Table 5 on page 116. If you experience problems in setting up the test, refer to "Solving Problems with Your System" on page 130.

Test 4 - GPS Receiver Testing

If you have an Agilent digital receiver, make sure that you have tested the receiver using either method 1 (page 106), method 2 (page 112), or method 3 (page 114) described earlier in this chapter. It is recommended that you know the GPS position, the longitude and latitude, of where you do the test.

Setting Up the Hardware

1 Connect the system components per the instructions in Chapter 3.

2 Power the system on. Allow 30 minutes for the scanner to stabilize before testing.

3 If the system is equipped with a GPS/DR Navigation unit, move the vehicle approximately 10 feet.

Testing the Signal

1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 Verify that the navigator is enabled in the System Setup view.

4 Click **Log > Start Logging**.

5 Open the Route Map view.

Passing the Test

If the status area of the Route Map view reports the same longitude and latitude of your current location, the GPS is ready for use. If the navigator is not communicating, a dialog box with an error message appears.

If you experience problems in setting up the test, refer to "Solving Problems with Your System" on page 130.

## Test 5 – High Speed Scanner Testing by Measuring Known Channels

Setting Up the Hardware

1 Connect the system components per the instructions in Chapter 3.

2 Power the system on.

Testing the Scanner

1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 Select known active channels in the High Speed Scanner Properties dialog box. Click **Help** in the dialog box for instructions.

4 Click **View > Scanner Table** to open the view.

5 Click **Log > Start Live Mode**.

Passing the Test

You should see an indication of signal strength from the active channels in your area. If low values are indicated for all channels, verify that the antenna is connected properly, and that the correct channel numbers have been added to the scan list in the High Speed Scanner Properties dialog box.

Test 6 – High Speed Scanner Testing Using a Signal Generator

NOTE	This procedure requires that you have the appropriate signal generator for the scanner technology that you are testing.

Setting Up the Hardware

1 Connect the system components per the instructions in Chapter 3, but do not connect the scanner's antenna.

2 Power the system on.

3 Power the signal generator on.

4 Adjust the signal generator's output level to approximately −70 dBm.

5 Connect the signal generator to the RF antenna (TNC) connector of the scanner.

Testing the Scanner

1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 In the High Speed Scanner Properties dialog box, add several channels to the scan list. Choose channels at the low end, high end, and middle of the channel range. Click **Help** in the dialog box for instructions.

4 Click **View > Scanner Table** to open the view.

5 Click Log > Start Live Mode.

6 Adjust the signal generator to the frequency that corresponds to the lowest channel you have selected.

7 Check the signal strength indicated in the Scanner table view.

8 Adjust the signal generator to the frequency that corresponds to each of the other channels that you have added to the scan list, while checking the signal strength indicated in the view.

Passing the Test

Verify that the level indicated in the Scanner Table view is reasonably close to the generator output, considering the number of cable connections and losses. If low values are indicated for all channels, verify that the antenna cable is connected properly, and that the correct frequencies for the channel numbers you have selected have been used.

Test 7 - Phone Testing Using a Test Call

Setting Up the Hardware

1 Connect the system components per the instructions in Chapter 3.

2 Power the system on.

Testing the Phone
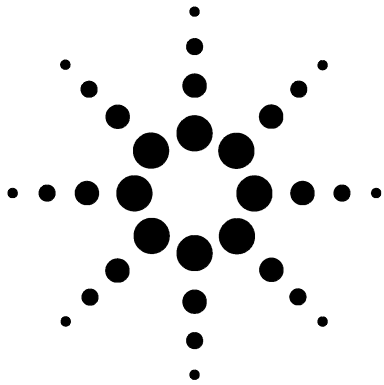
1 Start the E6474A software.

2 Refer to "Identifying the Devices" on page 94, and perform the procedure if you have not already done so.

3 Configure the Autodialing options in the Properties dialog box. Click **Help** in the dialog box for instructions.

4 Open the view that shows signal parameters:

5 For CDMA, click **View > CDMA Phone Status**.

6 For GSM, click **View > GSM Signal.**

7 For iDEN, click **View > iDEN Signal Parameters**.

8 For TDMA, click **View > IS 136 Phone**.

9 Click **View > Call Stats** to open the call statistics view.

10 Click **Log > Start Logging**.

Passing the Test

In the signal parameters view, you should see an indication of signal strength and other air interface parameters. The Call Stats view indicates the call progress and call termination results. If all calls are logged as "blocked," verify that service for the phone has been activated, and that the phone's battery is fully charged. Also recheck all cable connections.

• Click **Log > Stop** to end the test.

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5
Get results fast

What You'll Find in this Chapter

To do this	See this
Learn to use the software	"Using Quick Basics — the Online Tutorial" on page 122
Get information about taking measurements	"Online Help" on page 124

> **WARNING** **Drivers should not operate the Agilent E6474A system while the vehicle is in motion.**

Using Quick Basics — the Online Tutorial

As part of the product, the Agilent E6474A includes Quick Basics, an online tutorial. The opening screen is shown in Figure 50. It is recommended that you complete Quick Basics before you use the Agilent E6474A system.
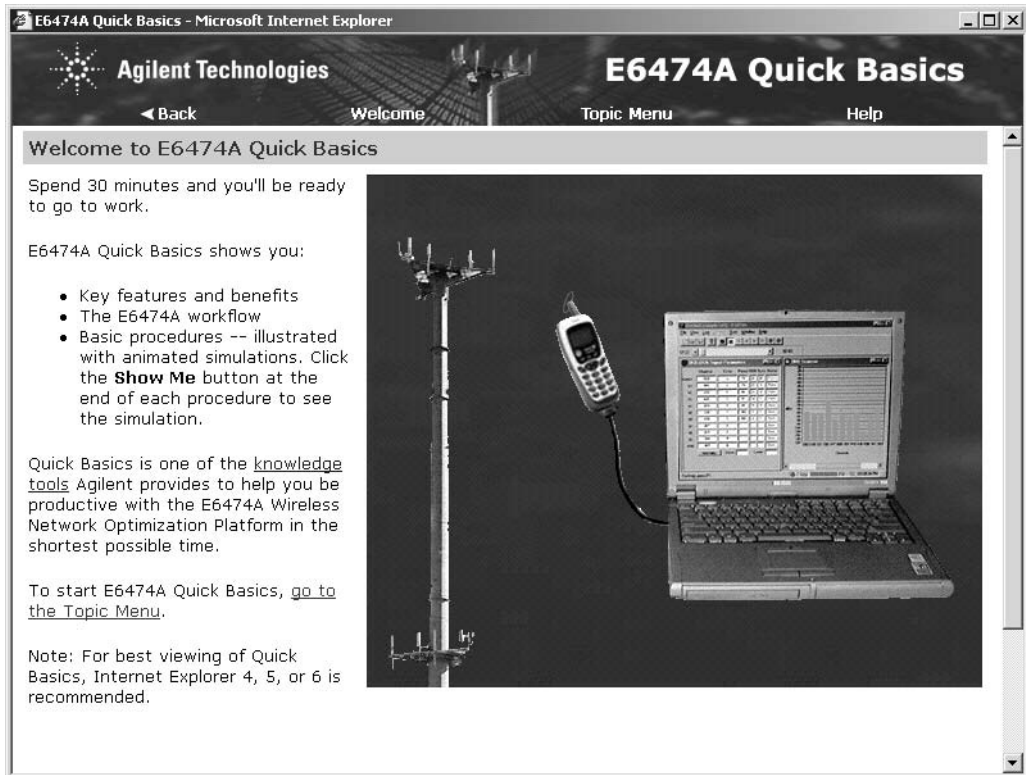
Figure 50   The E6474A Quick Basics tutorial

Quick Basics provides an overview of the capabilities of the Agilent E6474A. It also demonstrates the most common tasks you'll perform, and then guides you through those tasks in a simulation of the program.

Run the Tutorial

Do this	See this
1 Click **Start > Programs > Agilent Wireless Solutions > E6474A > Reference > Tutorial.**	The tutorial opens in your browser window.
2 Read the Welcome page and then click **Topic Menu**.	The Topic menu lists the Key Features and Quick Tour, as well as the available procedures.
3 To see an overview of the Agilent E6474A, click **Quick Tour**.	View the Quick Tour and then choose the procedures that interest you or view them in order to get a good introduction to the software.
4 When you have completed Quick Basics, or want to exit, close the browser windows.	The Quick Basics is closed. Run it again any time for a brush up.

After the Tutorial

When you have finished running the tutorial, you can continue learning about the system by reviewing these and other online help topics:

- **What's New** to familiarize yourself with changes from the latest release.

- **Getting started** for basic information on using the software and getting help

- **How do I...** for valuable how-to information on using the software

- And, of course, the online help provides details about every aspect of the software, as well.

Online Help

The software includes context-sensitive, HTML-based online help. In the help, you'll find all the information you need to make measurements with the Agilent E6474A software, including procedures, measurement parameters, and tips. The help opens in a browser window, separate from the E6474A application window.

Accessing Online Help

1 Press the **F1** key or click the **Help** button, when shown, to display the help topic with detailed information about the options, check boxes, and text boxes.

2 For help on configuring a view, open the view, then press **F1**.

Figure 51 shows the Contents tab on the left, and a typical help topic on the right.
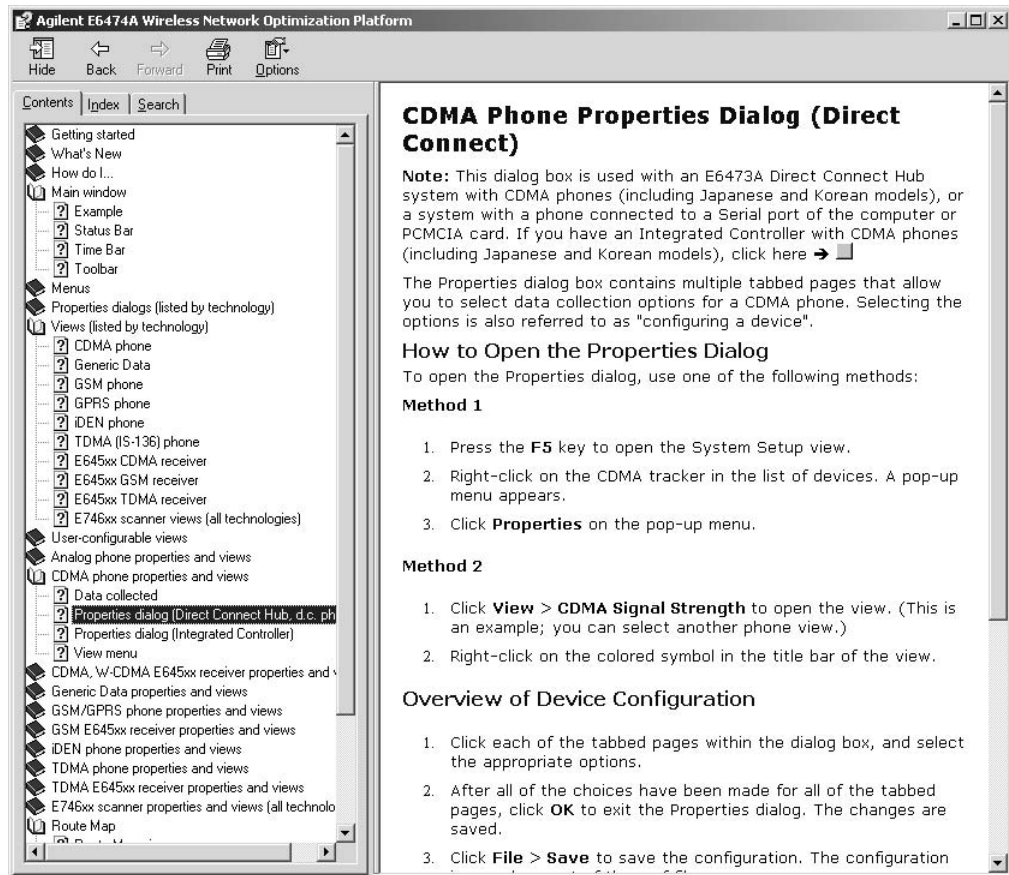
Figure 51   A typical online help browser display

The online help can also be accessed in the following ways:

• Click **Start > Programs > Agilent Wireless Solutions > E6474A > Help > E6474A Help**.

• With the E6474A software running, click **Help > Help Topics** to open the Help menu and a list of items that are new for the current software release.

Using Online Help

Following are some tips for using the software's online help system.

Getting familiar with new features

When you display the online help from the Help menu, a list of new software features automatically appears in your browser as shown in Figure 52.
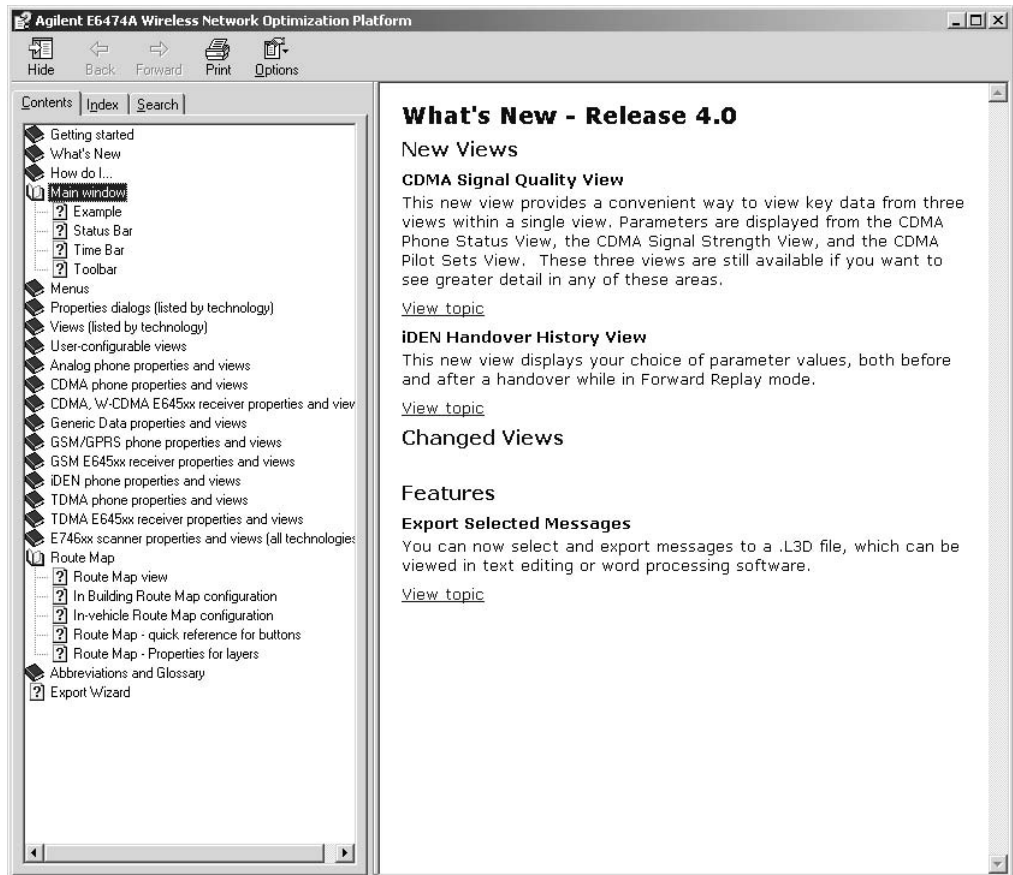
Figure 52 The What's New topic

This topic lists and briefly describes each new feature for the current release of the software. You can display detailed information for any new feature by clicking the **View topic** link.

Using the Contents Tab

The Contents tab lists all the topics in the online help.

1 Click the **Contents** tab to look at the topics by category.

2 Click a plus (+) sign or double-click a book icon to view its contents. It may include more Book icons or topics.

3 Click a topic to open that topic in the Help window.

Using the Index Tab

The Index tab lets you search through an alphabetical list of topics to find those relating to the text you type in the text field.

1 Click the **Index** tab to look at the list of index entries.

2 Type your subject in the **Type Keywords** box.
Or, scroll through the list in the list of entries, and double-click the term to list topics.

3 If more than one topic is available for the keywords you selected, a **Topics found** box appears from which you can select the topic of interest.

4 Double-click a topic to view it in the Help window.

Using the Search Tab

The Find tab lets you search the online help to find topics that include the words or phrases you type in the text box.

1 Click the **Search** tab to search for words or phrases used in the help topics.

2 Type the word or Phrase you are looking for in the text box.

3 Click the **List Topics** button to display topics that contain the word or phase you enter in the bottom list box.

4 Double-click a topic to open the help window for that topic.

Getting Information about Views

To learn about the views available for a device, follow these steps:

1 Start the online help.

2 Click the **Contents** tab.

3 Open the book for the phone or receiver.

4 Open the View Menu topic.

5 Click the links for the views listed.

**Agilent E6474A
User's Guide**

6
Get Assistance, if You Need It

What You'll Find in this Chapter

To do this	See this
Solve problems with your system.	"Solving Problems with Your System" on page 130
Review frequently asked questions.	"Frequently Asked Questions" on page 133
Update E645xx receiver firmware.	"Updating E645xx Receiver Firmware" on page 134
Contact Customer Support.	"Contacting Customer Support" on page 137
Return the system for service.	"Returning the System for Service" on page 139

Solving Problems with Your System

Device Communication Problems

Occasionally, when you probe a COM port, the error message in Figure 53 may be displayed

Figure 53   No device error message

Causes

This message is displayed for the following reasons:

- The Direct Connect Hub or a device connected to a serial port is not powered on.
- The device has a defective interface cable.
- The serial port has no device connected to it.
- An iDEN phone is communicating at the wrong baud rate.
- The device itself is defective.

Remedies

- Before using the Refresh Port command to probe the COM port to identify the devices, verify that all devices are connected and powered on. Devices include the Direct Connect Hub (if equipped), phones, scanner, receivers, and navigator. Refer to Chapter 3 for cable connection details.
- If you have an iDEN phone, perform the procedure under "Setting an iDEN Phone's Baud Rate" on page 131.

- If you have a Sagem phone that is capable of operating in Data mode, refer to "Changing a Sagem Phone's Operating Mode" on page 131.

- In the System Setup view, right-click another COM port, then select the Refresh Port command.

- Use a systematic approach to isolate a hardware problem. If available, replace a suspected defective device or cable with a known working device or cable. Replace only one component at a time, then retest.

Setting an iDEN Phone's Baud Rate

The baud rate for any iDEN phone must be set to 19200 baud, otherwise the phone may not be identified. The following is the procedure for the i1000 Plus phone.

1 Power up the phone. Wait for "Phone Ready" to be displayed.

2 Press the **Menu** key 3 times.

3 Press the key under **Prgm** shown in the display. The Programming Menu is displayed.

4 Press the key under **OK** in the display.

5 Press the right arrow key until Set Baud Rate: <value> is displayed.

6 Press the key under **OK** in the display.

7 Press the right arrow key until **19200** is displayed.

8 Press the key under **OK** in the display.

9 Press the key under **Exit** in the display.

Changing a Sagem Phone's Operating Mode

The Sagem OT-55P phone can operate in either of two modes, Trace or Data. A communication error may occur if the wrong mode is selected. If you are making parameter measurements, it must be set to Trace mode.

Below is an example of the phone's menu commands used for switching modes. Refer to the documentation included with your phone for the actual key-press sequence.

With the phone on, key in the following:

1 Menu, 44, (down arrow), #, 8.

2 Use the up/down arrow keys to select TRACE.

3 Select OK.

Known Issues

There are some known minor problems associated with certain phones. They are listed in the "Known Issues" topic in the software's online help. To view this topic, follow these steps:

1 Open the help as described under "Online Help" on page 124.

2 Open the **Getting Started** book on the help Contents tab.

3 Double-click **Known Issues** to open it.

Frequently Asked Questions

If you need installation or application assistance, refer to the web site at:

http://www.agilent.com/find/E6474A

To access the frequently asked questions section:

1 Scroll to the **Library** section of the web page.

2 Click the **More** link.

3 Scroll to the **FAQ** section.

If you do not have access to the web, contact your local Agilent Technologies representative for information.

Updating E645xx Receiver Firmware

NOTE   If your hardware configuration includes daisy-chained E645xx receivers, you must first disconnect the receivers, then connect one receiver at a time, and upgrade the firmware on each receiver. When you are finished updating the firmware, reconnect the daisy-chain, and reconfigure the daisy-chained receivers.

1 In the System Setup view, configure a receiver measurement view. Once data logging starts, the E6474A software determines if the Agilent E645xx digital receiver has the correct firmware. If not, the message box in Figure 2 appears.

Agilent Receiver   ☒

The Agilent E6450A receiver (Unknown E64xx Receiver (Id=2)) does not have the latest firmware. The measurements in this version of the software cannot be run with the current version of firmware.

The current version of firmware is: 1.00.03
The latest firmware available in this version of software is firmware revision 1.00.04

Would you like to update the firmware in your Agilent E6450A receiver now?

[Yes   ]   [No   ]

Figure 54   Firmware upgrade required, first dialog box

2 Click **Yes**. The message box in Figure 55 appears.
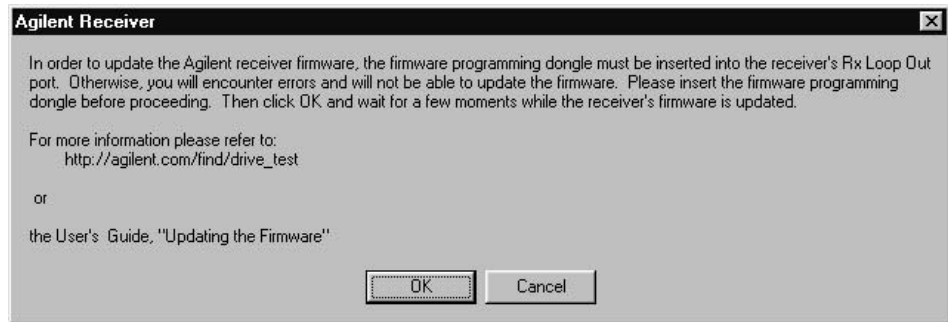
Figure 55 Firmware upgrade required, second dialog box

3 Insert the firmware programming dongle into the Rx Loop Out port of the receiver, as shown in Figure 56.

firmkey.cdr
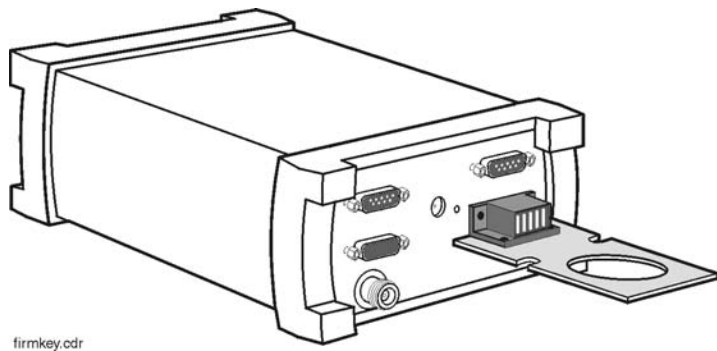
Figure 56 Receiver with dongle attached

4 Click **OK**. When the update is complete, the dialog box shown in Figure 57 appears. This indicates that the update is complete.
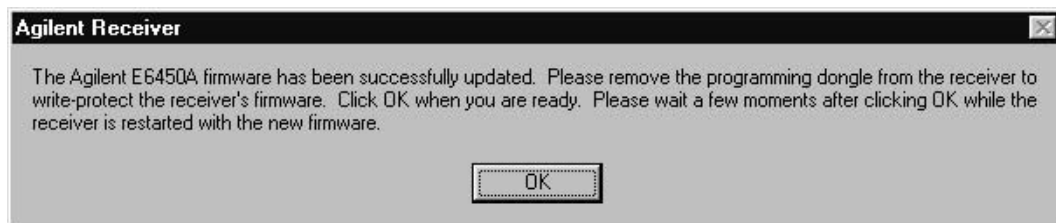
Figure 57   Firmware update successful dialog box

5 Remove the dongle from the receiver. Stop and restart data logging.

Contacting Customer Support

Technical Telephone Assistance

Before you make a call to technical support, you can save yourself time by ensuring that you have the following information at hand:

- Software revision (found by selecting **Help > About E6474A** while running the E6474A software)
- Phone brand and model
- Error message received (text)
- Configuration (how the phones are connected)
- Operating system used (Windows 98, NT, or 2000)
- The brand and model number of the computer being used
- How much RAM is available on the computer, and the amount of free hard disk space

Your E6474A Wireless Network Optimization Platform software includes 12 months of Response Center Support. To use the telephone assistance:

1 Install the software.

2 The Customer Business Center will provide you with a packet of information, which includes your system handle number. Please refer to that number when you call for support. To establish a Support Contact, please call the Customer Business Center.

3 Ask the Agilent Technologies engineer your question.

Numbers to Call

For technical support, call the appropriate number shown in Table 7, or contact your local Agilent Technologies Sales and Service Office.

Table 7 Call Center phone numbers

Region	Phone Number
Americas	+1-800-452-4844, press 3
Australia	+1-800-629-485
Europe, Africa, Middle East	+32-(0) 2404 9340
Singapore	1-800-375-8100

For up-to-date, country-specific contact information, go to **http://www.agilent.com/comms/contactus.**

Returning the System for Service

The instructions in this section explain how to properly package the system for return to Agilent Technologies.

NOTE	Please notify Agilent Technologies before returning your system for service. Any special arrangements for the system can be discussed at this time. This will help Agilent Technologies repair and return your system as quickly as possible.

Warranty

If the system is still under warranty or is covered by an Agilent Technologies maintenance contract, it will be repaired under the terms of the warranty or contract. If the system is no longer under warranty or is not covered by an Agilent Technologies maintenance plan, Agilent Technologies will notify you of the cost of the repair after examining the unit.

When a system is returned to Agilent Technologies for servicing, it must be adequately packaged (see "Preparing the System for Shipping" on page 140) and have a complete description of the failure symptoms attached.

When describing the failure, please be as specific as possible about the nature of the problem. Include copies of additional failure information (such as receiver or computer failure settings, data related to system failure, and error messages) along with the system being returned.

Preparing the System for Shipping

Do This	Additional Information

1 Write a complete description of the failure and attach it to the system.	Include any specific performance details related to the problem. The following information should be returned with the system:
	• Type of service required
	• Date system was returned for repair
	• Description of the problem:
	  • Whether problem is constant or intermittent
	  • Whether system is temperature-sensitive
	  • Whether system is vibration sensitive
	  • System settings required to reproduce the problem
	  • Error Code
	  • Performance data
	• Company Name and return address
	• Name and phone number of technical contact person
	• Model number of returned system
	• Full serial number of returned system
	• List of any accessories returned with the system

2 Cover all front and rear panel connectors that were originally covered when you first received the system.	
3 Pack the system in the original shipping containers. Original materials are available through Agilent Technologies office. See step 4 for more information.	
4 Wrap the system in anti-static plastic to reduce the possibility of damage caused by electrostatic discharge.	For systems weighing less than 54 kg (120 lbs.), use a double-walled, corrugated cardboard carton of 159 kg (350 lbs.) test strength. The carton must be large enough to allow 3 to 4 inches on all sides of the system for packing material, and strong enough to accommodate the weight of the system. Surround the equipment with 3 to 4 inches of packing material, to protect the system and prevent it from moving in the carton. If packing foam is not available, the best alternative is S.D-240 Air Cap™ from Sealed Air Corporation (Commerce, California 90001). Air Cap looks like a plastic sheet filled with air bubbles. Use the pink (anti-static) Air Cap to reduce static electrical damage. Wrapping the system several times in this material will protect the system and prevent it from moving in the carton.

Do This	Additional Information
5 Seal the carton with strong nylon adhesive tape and mark it "FRAGILE, HANDLE WITH CARE".	
6 Retain copies of all shipping papers.	

CAUTION   Cover electrical connectors to protect sensitive components from electrostatic damage. Instrument damage can result from using packaging materials other than the original materials. Never use styrene pellets as packaging material. They do not adequately cushion the system or prevent it from shifting in the carton. They may also cause system damage by generating static electricity.

6 Get Assistance, if You Need It
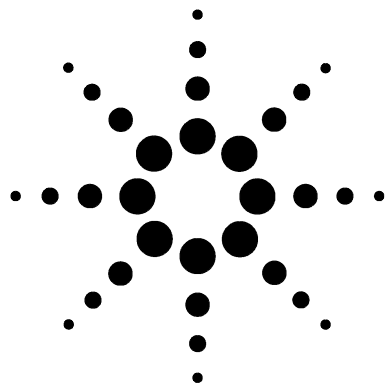
Appendix A
Safety and Regulatory Information

Overview

This appendix contains important warnings and cautions for hardware products used in conjunction with the Agilent E6474A software.

Warning and Caution Notices

WARNING The **WARNING!** notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING!** notice until the indicated conditions are fully understood and met.

CAUTION The **CAUTION!** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION!** notice until the indicated conditions are fully understood and met.

General Safety Considerations

The Agilent digital receiver has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

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WARNING   **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

No operator serviceable parts are inside this system. Refer servicing to a qualified Agilent Technologies, Inc. service center. To prevent electrical shock, do not remove the covers.

To prevent electrical shock, disconnect the equipment from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean the receiver internally.

Installation, Use, and Storage

CAUTION   The Agilent 645xx digital receiver is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2, per IEC 61010 and 664 respectively.

Enclosure protection IP40 according to IEC 529.

Install the system according to the enclosure protection provided. This system does not protect against the ingress of water. This instrument protects against entry of solid foreign objects greater than, or equal to, one millimeter.

Signal and Input Power

CAUTION   The input power to the Agilent 645xx digital receiver should not exceed −15 dBm. Power levels greater than +10 dBm will damage the instrument.

For continued protection against fire hazard, replace the line fuse (cigarette lighter/2 amp 32 V FB fuse) only with the same type of rating (type nA/nV). The use of other fuses or materials is prohibited.

If you use external power, install the instrument so the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuit from the mains supply before other parts of the instrument.

If you do not use external power, position the product so you can easily operate the disconnecting device.

Always use the power cords supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.

Symbols

Table 8 lists standard symbols that appear on equipment panels.

Table 8   Equipment panel symbols

Symbol	Description
∼	AC power input
⎓	DC power input
|	Power switch ON position
⏻	Power switch STANDBY or IGNITION SENSE position

Symbol	Description
⭘	Power switch OFF position
CE	Registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
CSA	The CSA mark is a registered trademark of the Canadian Standards Association
ISM 1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group Class A product (CISPER 11, Clause 4).
N10149	The C-Tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radio Communications Act of 1992.
ICES-001	This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norma NMB du Canada.
ICES / NMB-001	This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).

Declaration of Conformity - Analog and Digital Cellular RF Receivers

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014	
Manufacturer's Name:	Agilent Technologies, Inc.
Manufacturer's Address:	1400 Fountaingrove Parkway Santa Rosa, CA 95403-1799 USA
Declares that the products	
Product Name:	Analog and Digital Cellular RF Receivers
Model Numbers:	E6450B, E6450C, E6451A, E6451C, E6452A, E6452C, E6453A, E6453C, E6454A, E6454C, E6455C, E6456C, E6457C, E6458C
Product Options:	This declaration covers all options of the above products.

Conforms to the following product specifications:

IEC 61326:1997+A1:1998+A2:2000/ EN 61326:1997+A1:1998+A2:2001

EMC: <u>Standard</u>   <u>Limit</u>

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 - 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995, CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

Santa Rosa, CA, USA   11 October, 2002

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor

Declaration of Conformity - Agilent Direct Connect Hub

The Manufacturer's Declaration of Conformity document is available upon request. Please contact your Agilent Technologies sales representative or the Agilent Technologies Customer Support Center for your country.
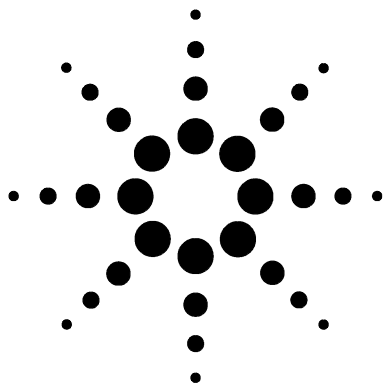
Appendix B
GPS Connections for E74xx Systems

Overview

This appendix is provided for users of legacy E74xx Drive Test Solutions. It contains cabling information for existing systems with the GPS options listed below. These options are not available for new E6473B systems. For complete information, refer to the documentation that was supplied with your original E74xx Drive Test Solution. Included here are the following:

- E645xx receiver with internal GPS option
- E645xx receiver without internal GPS option
- Trimble Placer GPS 455DR
- RDS 3000 DGPS baud rate settings
- Sample configurations
  - Phone, receiver with GPS, and optional differential GPS
  - Phone, receiver, and Placer GPS 455
  - Phone, receiver, Placer GPS and differential GPS
  - Phone, receiver, Placer GPS with dead reckoning
  - Phone, receiver, and model 400 or SV6

E6473B High Speed Direct Connect Hub Connections

The sample configurations in this chapter show phones and receivers connected directly to computer serial ports. If your system includes an E6473B High Speed Direct Connect Hub, devices are connected to it as follows:

- Phones are connected to the PHONE ports.
- One receiver is connected to the RECEIVER port, up to four receivers are daisy-chained.

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- The navigator data cable is connected to the AUX port. All other connections to the navigator are the same as shown in the figures.

For more information on systems that include the E6473B High Speed Direct Connect Hub, refer to Chapter 3.

E645xx Receiver with Internal GPS Option

Agilent E645xA and E645xB receivers with the GPS option and Agilent E645xC receivers include an internal GPS receiver. When the GPS receiver is locked onto the GPS signal, navigation data is provided with the receiver measurements.

To set up the GPS antenna:

1 Connect the GPS antenna to the GPS ANTENNA connector of the receiver.

2 Position the magnetic-mount GPS antenna 18 inches (45.7 cm) away from other antennas. The GPS antenna must have an unobstructed view of the horizon for best performance.

External 1 PPS Signal

An external 1 PPS (Pulse Per Second) signal is required for any of the E6454xx CDMA receivers without internal GPS to "lock" for correct PN correlation when making CDMA pilot analysis measurements.

All E645x receivers without the internal GPS option can use a 1 Pulse Per Second (1PPS) signal from an external GPS to improve the receiver's frequency accuracy specification and performance. This signal must be present on pin 9 of the cable connected to the receiver's GPS-RS232 port, as shown in Figure 58. Cables purchased from Agilent meet this requirement.

If you are using a GPS not supplied by Agilent, consult the GPS manufacturer's documentation to determine if its navigation data cable provides the 1 PPS signal.

**Agilent E645x
RECEIVER**

GPS RS-232 Connector

```
1  2  3  4  5
o  o  o  o  o
   o  o  o  o
   6  7  8  9
```

pin#   Connections used

1   DCD
2   RX ⟵   Input to Agilent E645x Receiver from the GPS unit
3   TX ⟶ Output to GPS Unit
4   DTR
5   GND ⟶ Ground
6   DSR
7   RTS
8   CTS
9   1PPS*⟵ 1 Pulse per second
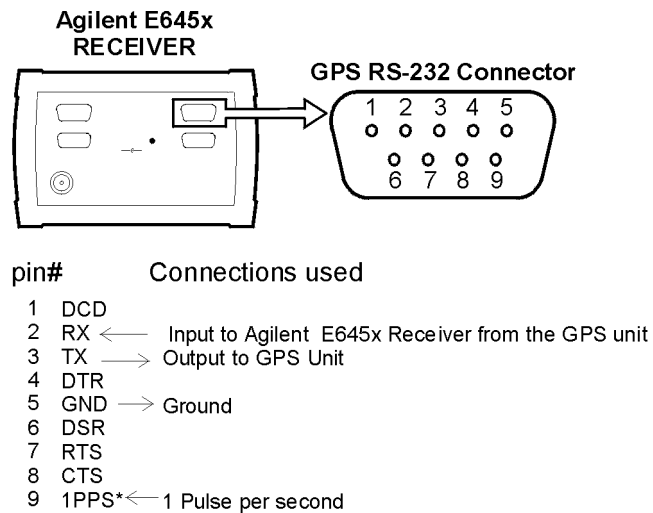
* 1PPS (one pulse per second, TTL level or open collector) is supplied by the GPS
  unit and used as a reference in the Agilent E645x receiver.

The configuration shown is used in the following GPS Protocols:
- TSIP (Trimble Standard Interface Protocol)
- TAIP (Trimble ASCII Interface Protocol)
- NMEA (National Marine Electronics Association)

Figure 58   GPS RS-232 connector pin assignments

Trimble Placer GPS 455DR

If you are using Dead Reckoning, you must connect the Sensors cable. This cable requires a connection to the vehicle's odometer pulse signal. (See "Heading Sensor Cable Connections" on page 153 for details.) Contact Customer Support for assistance in locating the lead for this signal within your vehicle. After installation, the odometer pulse and heading sensors must be calibrated. See "Sensor Calibration" on page 154 for more information.

Figure 59 Trimble Placer GPS 455 cable connections

Cable Connections to the Panel

The following are general instructions for connecting the Trimble Placer cables. Specific configurations that utilize Differential GPS and/or the DIGITAL I/O port are shown in the examples on the following pages.

1 Connect to the GPS antenna to the GPS connector (see).

2 Connect the RS-232 navigation data cable (p/n 8120-8650) to the RADIO port.

3 Connect the opposite end of the cable to one of the following:

- GPS RS-232 port of the E645xx receiver (if equipped)

- An unused port of the Dual Serial Port PCMCIA card

- The AUX port of the E6473B High Speed Direct Connect Hub

4 If your system is equipped with a Differential GPS receiver, see "Phone, Receiver with GPS, and Optional Differential GPS" on page 158 for cable connections.

5 If you are using Dead Reckoning, connect the Sensors cable (Trimble p/n 30513) to the HEADING SENSOR port.

6 Connect the power cable (p/n 5182-1290) to the POWER connector.

7 Connect the opposite end of the cable to the 4-to-1 lighter socket adapter.

NOTE   Position the magnetic-mount GPS antenna 18 inches (45.7 cm) away from other antennas. The GPS antenna must have an unobstructed view of the horizon for best performance.

Heading Sensor Cable Connections

The Trimble Sensors cable has two inner cables (see Figure 60) that are to be connected as follows:

1 Connect the Red lead of the ODO 0 cable to the vehicle's odometer pulse signal.

2 Connect the Black lead of the ODO 0 cable to chassis ground.

3 Connect the HEADING SENSOR cable to the heading sensor.

To Placer GPS 455

Odometer 0 (red)
GND (blk) } ODO "0"
Odometer 1 (red)
GND (blk) } ODO "1"
GND (blk)
+5V (red) } 2 conductor zip cable
Backup (wht)

To Heading Sensor
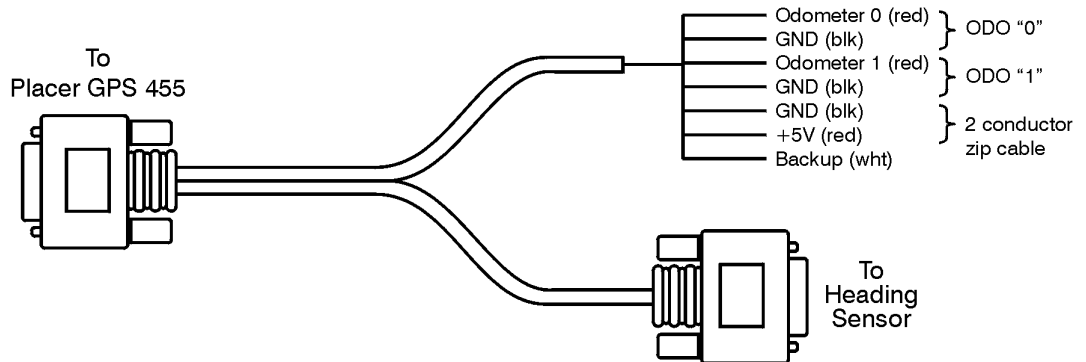
headsens.cdr

Figure 60   Trimble Placer Sensors cable, Trimble p/n 30513

Sensor Calibration

If you are using Dead Reckoning, the Heading and Speed sensors must be calibrated after you install the navigator. The DOS application PLCRINIT for calibrating the sensors is included with your system on a floppy disk. Copy the pinit140.exe and pinit140.ini files to your computer's hard disk before starting the procedure.

NOTE	The speed sensor calibration procedure requires the vehicle to be driven a measured mile. The heading sensor calibration procedure requires the vehicle to be driven in continuous circles. Choose a location, such as a parking lot where this can be done.

Starting the PLCRINIT Calibration Program

PLCRINIT is a DOS program, set up to run at 9600 baud using the computer's COM1 serial port. To start the PSCRINIT calibration program:

1 Start the computer in DOS mode. (PLCRINIT does not run properly if it is started from the MS DOS Command Prompt in Windows.)

2 Type **pinit140.exe** to start the PLCRINIT calibration program. (If necessary, first use the DOS CD command to change the path to the directory that contains pinit140.exe.)

The PLCRINIT main screen is divided into two windows. The upper window provides the menus and choices for the calibration procedure. The lower window shows scrolling data not relevant to the configuration process.

3 Press **d** to enter the 455DR Sensor Setup menu.

4 Follow the instructions on each screen, pressing **Enter** after entering a choice in response to a prompt, except where "Press Any Key" is displayed, or the action takes effect without pressing Enter.

For additional information about the navigator, visit the Trimble Navigation web site at: www.trimble.com/mpc/placer.

Trimble also provides downloadable documentation on the Web. At the time of this printing, you can find the files (Microsoft Word and PDF formats) at http://www.trimble.com/mpc/placer/download/manuals.htm. If the URL has changed, use the search facility provided at the Web site (www.trimble.com).

NOTE   Do not download a new version of firmware unless you are instructed to by Agilent Customer Support.

RDS 3000 DGPS Baud Rate Settings

If your system includes a differential GPS receiver (86154A-230), you must set the baud rate of the DCI (Differential Corrections Inc.) Differential GPS model RDS 3000 to the same baud rate as that of the GPS to which it is connected.

1 Connect the RDS 3000 power cable to the vehicle. (Refer to the manufacturer's documentation for details.)

2 Connect the differential GPS to the SERIAL port of the computer.

3 Run the software supplied by DCI with the differential GPS (rtcmon.exe). (The file is contained on the disk that comes with 86154A-230.)

4 Press **F1** to set the correct baud rate for the differential GPS. Refer to Table 9 to set the baud rate for the Trimble model you are using.

Table 9   Trimble baud rate

GPS	DGPS Receiver Baud Rate	PC Serial Port Baud Rate
Placer GPS/DR	9600	9600
Trimble Placer GPS 455	9600	9600
Agilent E645x with internal GPS (Trimble model SK-8)	4800	4800

5 Press **F2** to set the baud rate for the computer's serial port.

When the differential GPS is correctly configured, it will start to send legible information to the computer. If the subscription is active, this information will be correction data; otherwise it will be scanned frequencies.

For more information about the navigators, please refer to the manuals supplied by Differential Corrections, Inc. and Trimble Navigation, Limited.

Sample System Configurations

This section contains illustrations of the many configurations that include an E645xx receiver and GPS. Follow the instructions for the system whose components best match your system's components. Phones are shown in the figures; however, a phone may not be included with your system. Cable part numbers can be found in Appendix F, System Information.

Power cables for the E645xx receiver, GPS, and computer are terminated with a lighter plug. After all other connections are made, connect the lighter plug for each device to the 4-to-1 lighter socket adapter.

NOTE   In the following figures, the hardware security key refers to the E6474A Software License Key, which must be connected to the PARALLEL port of the computer.

GPS RS-232 Data Cable Options

The following examples show an RS-232 connection to an E645xx receiver.

- If your system does not include an E645xx receiver or an E6473B High Speed Direct Connect Hub, connect the GPS RS-232 cable from the GPS receiver to the SERIAL port of the computer. The phones are connected to ports of the Dual Serial Port PCMCIA card.

- If your system does not include an E645xx receiver but does include an E6473B High Speed Direct Connect Hub, connect the RS-232 data cable from the GPS receiver to the AUX port of the Direct Connect Hub. The phones are also connected to the Direct Connect Hub. See Chapter 3 for detailed phone connection information.
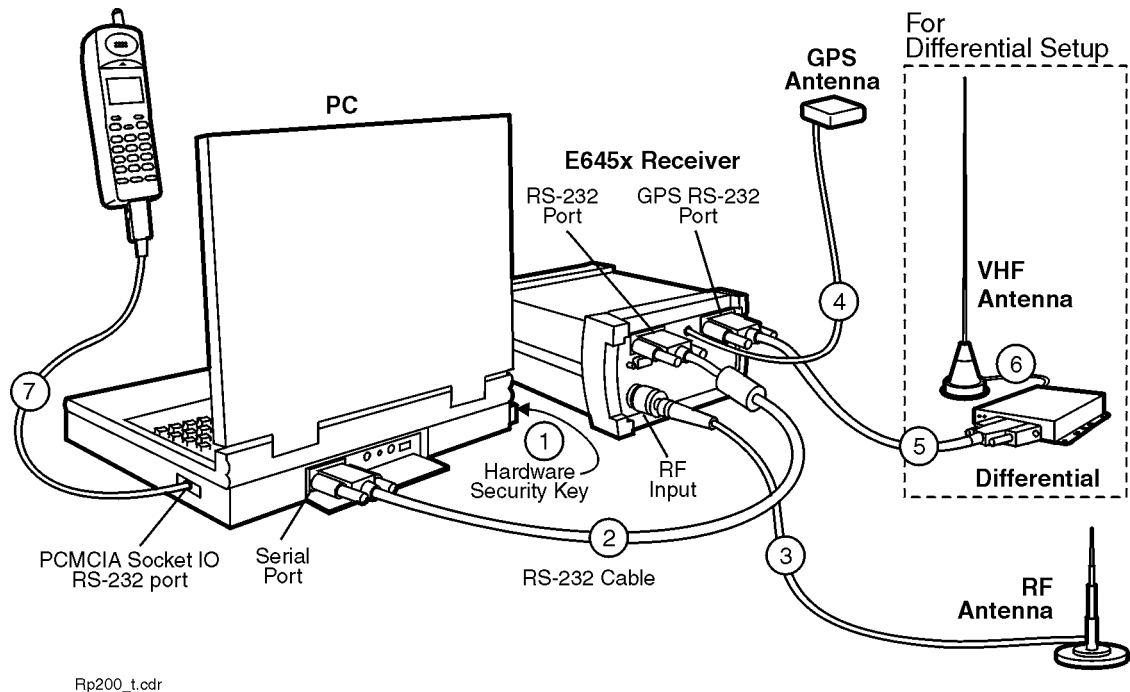
Rp200_t.cdr

Figure 61 Phone, E645xx receiver with GPS, and DGPS

Phone, Receiver with GPS, and Optional Differential GPS

1 Connect the software license key to the PARALLEL port of the computer.

2 Connect the RS-232 data cable to the RS-232 port of the receiver. Connect the opposite end to the SERIAL port of the computer.

3 Connect the RF antenna to the RF INPUT connector of the receiver. Use the supplied Type-N to TNC adapter, if necessary.

4 Connect the GPS antenna to the GPS ANTENNA connector of the receiver. Agilent Technologies recommends that a

"bulkhead mount" GPS antenna be used whenever possible for improved performance.

5 If equipped, connect the Differential GPS data cable from the DGPS receiver to the GPS RS-232 port of the receiver. The cable is included with the differential GPS receiver, 86154A-230.

6 If equipped, connect the Differential GPS VHF antenna to the antenna connector of the DGPS receiver.

7 If equipped, connect the phone interface cable to the phone. Connect the opposite end to a port of the Dual Serial Port PCMCIA card.

8 Connect the power cables to the Trimble Placer GPS 455, the Agilent E645x receiver, and the computer. Connect the lighter plug for each device to the 4-to-1 lighter socket adapter.

Phone, Receiver, and Placer GPS 455
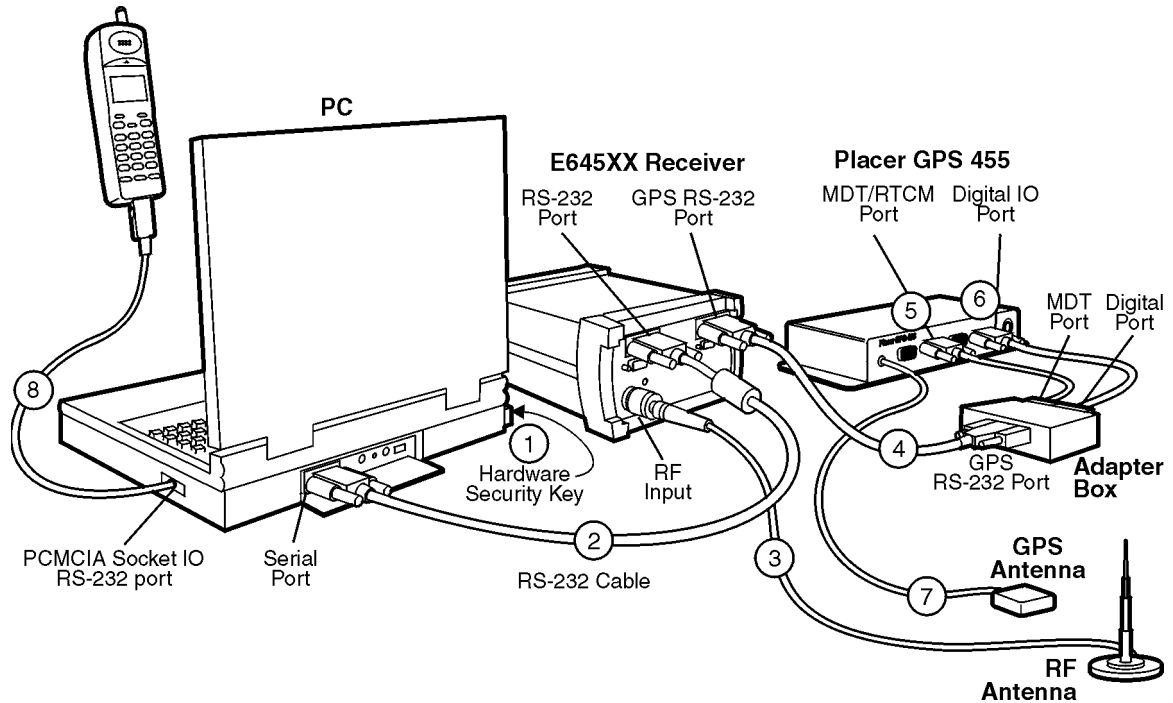
rp455dr.cdr

Figure 62   Phone, E645xx receiver with GPS, and DGPS

1 Connect the software license key to the PARALLEL port of the computer.

2 Connect the RS-232 data cable to the RS-232 port of the receiver. Connect the opposite end to the SERIAL port of the computer.

3 Connect the RF antenna to the RF INPUT connector of the receiver. Use the supplied Type-N to TNC adapter, if necessary.

4 Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 straight-through cable.

5 Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.

6 Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.

7 Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a "bulkhead mount" GPS antenna be used whenever possible for improved performance.

8 If equipped, connect the phone interface cable to the phone. Connect the opposite end to an unoccupied port of the Dual Serial Port PCMCIA card.

9 Connect the power cables to the Trimble Placer GPS 455, the Agilent E645x receiver, and the computer.

Phone, Receiver, Placer GPS and Differential GPS

Figure 63   Phone, E645xx receiver, Placer GPS and Differential GPS

1 Connect the software license key to the PARALLEL port of the computer.

2 Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system.

3 Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.

4 Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.

5 Connect the RTCM port of the Trimble-supplied communications cable to the differential GPS receiver, using the RS-232 cable included with the system. Connect the remaining port of the Trimble-supplied communications cable to the MDT/RTCM port of the Trimble Placer GPS 455 unit.

6 Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.

7 Connect the MDT/RTCM port of the adapter box to the MDT port of the Trimble-supplied communications "T" cable, connected to the Differential, using the RS-232 cable.

8 Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a "bulkhead mount" GPS antenna be used whenever possible for improved performance.

9 Connect the VHF Differential GPS antenna to the Differential GPS unit.

10 If equipped, connect the phone interface cable to the phone. Connect the opposite end to an unoccupied port of the Dual Serial Port PCMCIA card.

11 Connect the power cables to the Trimble Placer GPS 455, the Agilent E645x receiver, and the computer. Connect the lighter plug for each device to the 4-to-1 lighter socket adapter.

Phone, Receiver, Placer GPS with Dead Reckoning
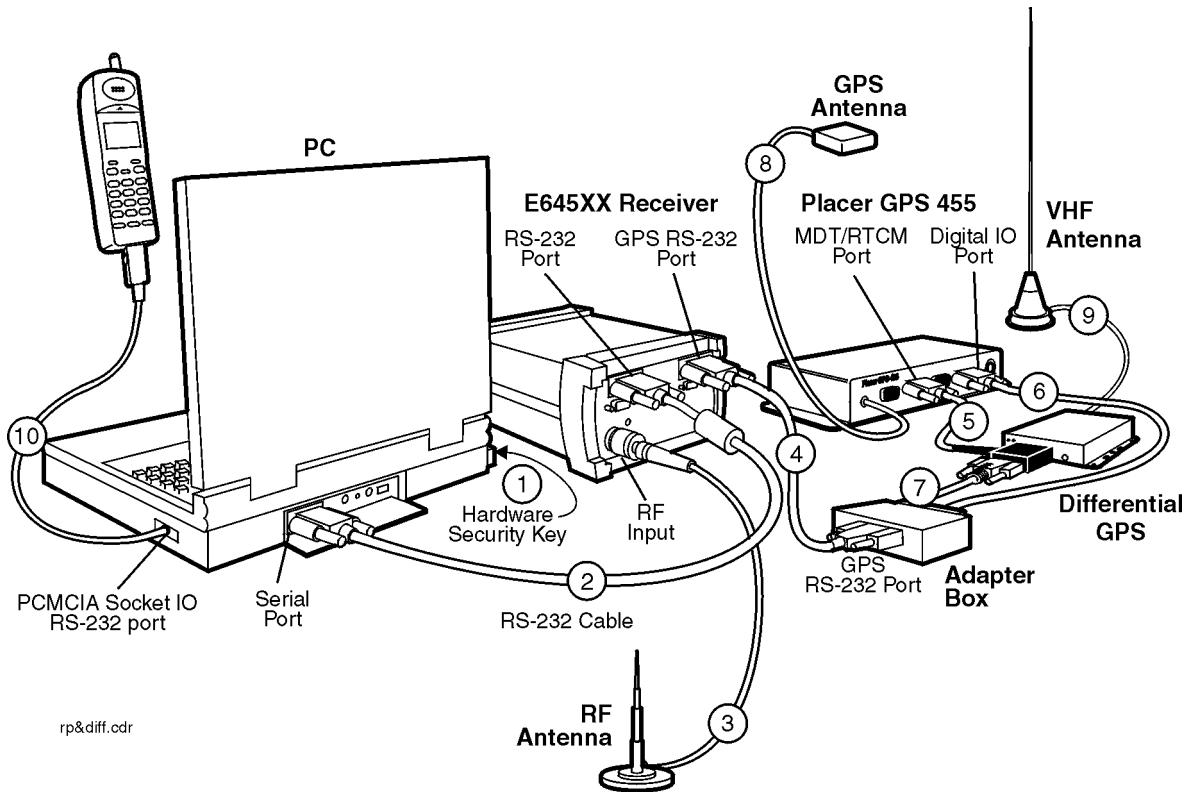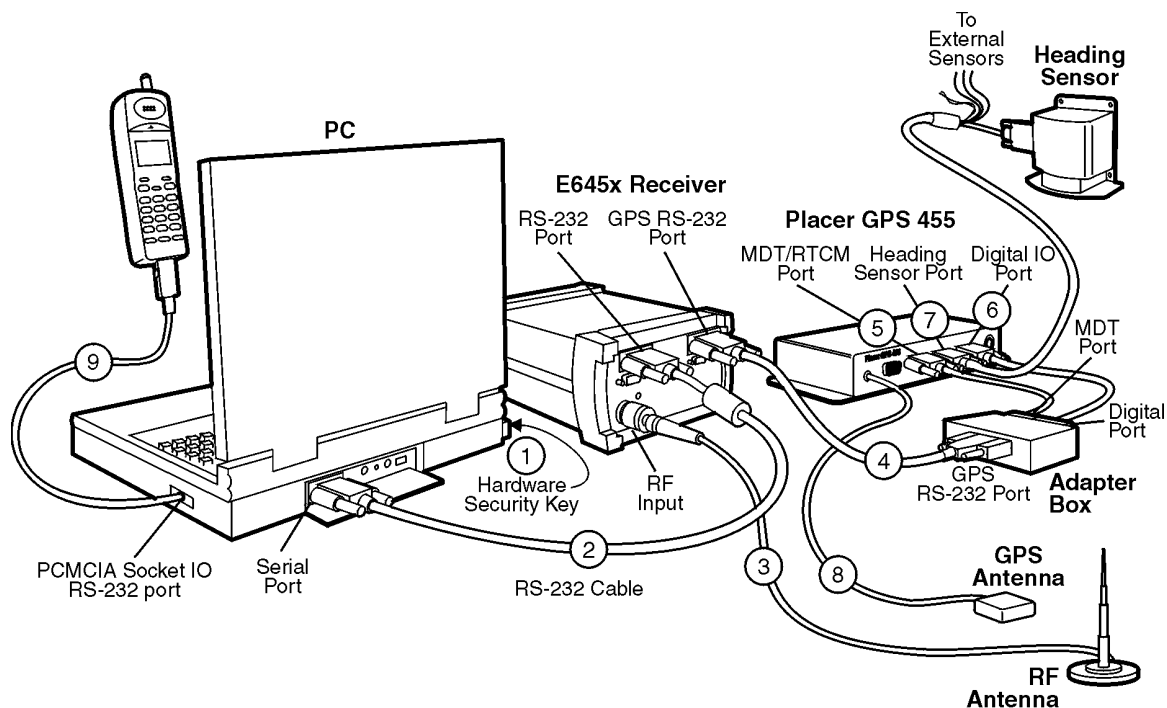

rpdrec.cdr

Figure 64   Phone, E645xx receiver, Placer GPS with Dead Reckoning

1 Connect the software license key to the PARALLEL port of the computer.

2 Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system.

3 Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.

4 Connect the GPS RS-232 port of the Agilent E645x receiver to the GPS RS-232 port of the adapter box, using the RS-232 cable.

5 Connect the MDT port of the adapter box to the MDT/RTCM port of the Trimble Placer GPS 455 unit, using the RS-232 straight-through cable.

6 Connect the digital port of the adapter box to the Digital IO port of the Trimble Placer GPS 455 unit, using the RS-232 cable.

7 Connect the Heading Sensor to the Heading Sensor port of the Trimble Placer GPS 455 through the female 9-pin connector on the DR sensor cable supplied by Trimble. (See Figure 64 on page 164.) The connector labeled Heading Sensor connects to the heading sensor; the connector labeled Sensors connects to the Placer GPS 455. (See Figure 64 on page 164.)

8 Connect the GPS antenna to the GPS ANT port of the Trimble Placer GPS 455 unit. Agilent Technologies recommends that a "bulkhead mount" GPS antenna be used whenever possible for improved performance.

9 If equipped, connect the phone interface cable to the phone. Connect the opposite end to an unoccupied port of the Dual Serial Port PCMCIA card.

10 Connect the power cables to the Trimble Placer GPS 455, the Agilent E645x receiver, and the computer. Connect the lighter plug for each device to the 4-to-1 lighter socket adapter.

Phone, Receiver, and Model 400 or SV6
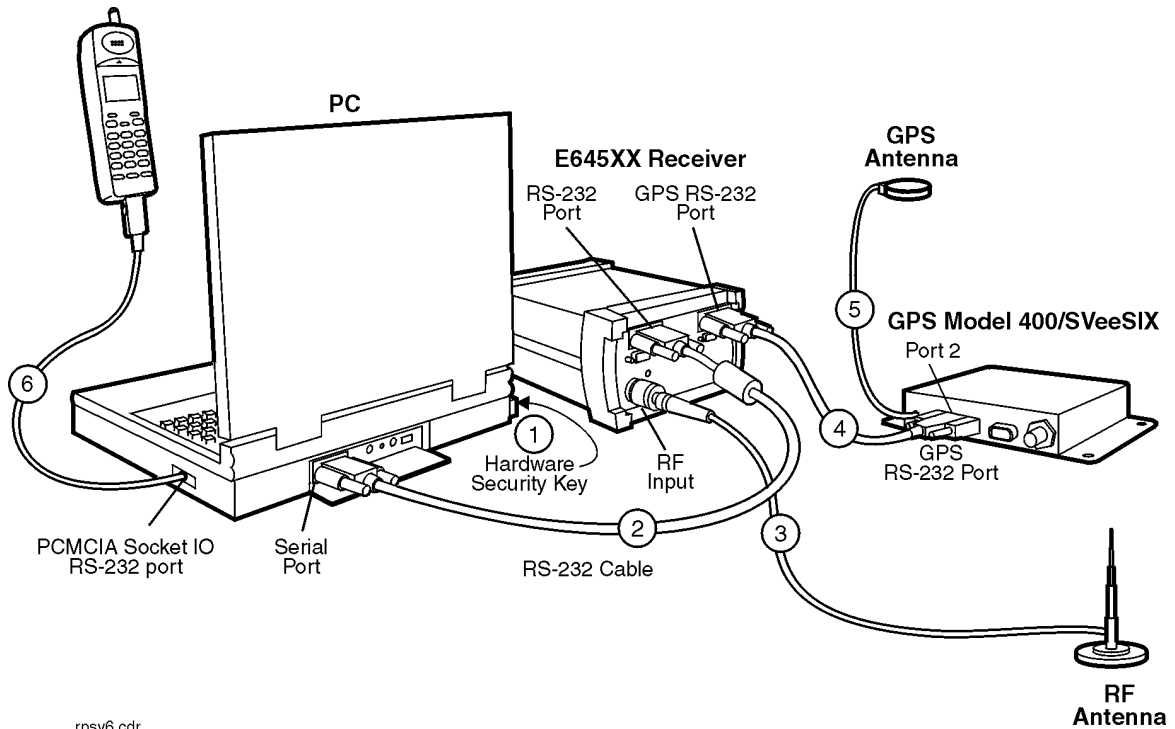
rpsv6.cdr

Figure 65 Phone, E645xx receiver and model 400 or SV6 GPS

| **NOTE** | The Trimble Placer SV6 Plus operates from 9 to 32 VDC (NO internal battery backup). The red wire must be tied to the positive side of the power supply. The black wire must be tied to the negative side of the power supply. Optionally, the yellow wire may be tied to a backup power source, such as a lithium battery (operates from 3.5 to 14 VDC). |

1 Connect the software license key to the PARALLEL port of the computer.

2 Connect the serial port of the PC to the RS-232 port of the Agilent E645x receiver using the RS-232 cable included with the system.

3 Connect the RF antenna to the RF input of the Agilent E645x receiver. Use the supplied Type-N to TNC adapter, if necessary.

4 Connect one end of a standard, straight-through, RS-232 9-pin cable to the GPS RS-232 port of the Agilent E645x receiver. Connect the other end of the RS-232 cable to the Trimble Placer GPS 400 or SV6 connector.

5 Connect the GPS antenna to the GPS ANT port of the Trimble Placer SV6/Placer GPS 400 unit.

6 If equipped, connect the phone interface cable to the phone. Connect the opposite end to an unoccupied port of the Dual Serial Port PCMCIA card.

7 Connect the power cables to the Trimble Placer GPS 400 or SV6 and the computer. Connect the lighter plug for each device to the 4-to-1 lighter socket adapter.

B GPS Connections for E74xx Systems

Appendix C
Connection Panels and LED Indicators

Overview

This appendix contains information about the panel connectors and LED indicators of the E6473B High Speed Direct Connect Hub, E645xx receiver, E746xx scanner, the Agilent High Speed direct connect GPS/DR Navigation unit, and the Trimble Placer 455DR.

For this information	See this
E6373A Direct Connect Hub connections	"E6473B High Speed Direct Connect Hub" on page 170
E545xx receiver	"E645xx Receiver" on page 172
E746xx scanner	"E746xx Scanner" on page 173
Agilent High Speed Direct Connect GPS/DR	"Agilent High Speed Direct Connect GPS/DR Navigation" on page 175
Trimble Placer GPS 455DR	"Trimble Placer GPS 455DR" on page 177
Cable part numbers	Appendix D, "System Information"
Installation and connection instructions	Chapter 3, "Set Up Your System"
A list of cables used in the system	Appendix D, "System Information"

E6473B High Speed Direct Connect Hub
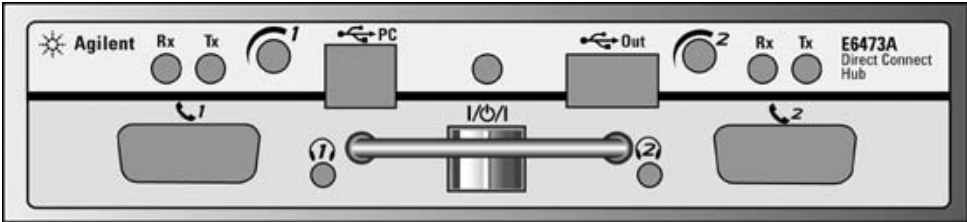
Figure 66   E6473B High Speed Direct Connect Hub front panel

Table 10   Direct Connect Hub front panel descriptions (see Figure 66)

Reference	Name	Description or Cable Connection
Rx	Receive Data LED (Phone 1, 2)	Flashes when phone data is received
Tx	Transmit Data LED (Phone 1, 2)	Flashes when phone data is transmitted
⌒¹	Phone 1 audio level	Controls headset 1 audio volume
⭠PC	USB Computer port	Connect to USB Data Cable
⭠Out	USB Out port	Plug in the software license key, or connect cable to next E6473B
⌒²	Phone 2 audio level	Controls headset 2 audio volume
☎1	Phone 1 port	Connect to phone interface cable
(1)	Headset for Phone 1	Connect to headset
I/O/⏻	Power switch	Left position = On Center position = Off Right position = Ignition Sense
(2)	Headset for Phone 2	Connect to headset

Reference	Name	Description or Cable Connection
☎2	Phone 2 port	Connect to phone interface cable
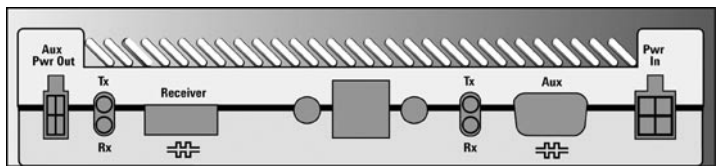
Figure 67   E6473B High Speed Direct Connect Hub rear panel

Table 11   E6473B High Speed Direct Connect Hub rear panel descriptions (see Figure 67)

Reference	Name	Description or Cable Connection
Aux Out	Power out connection	Connect to power cable for second E645xx Receiver (if equipped)
Rx	Receive Data LED (Receiver or Aux ports)	Flashes when data is received
Tx	Transmit Data LED (Receiver or Aux ports)	Flashes when data is transmitted
Receiver	Receiver or Scanner Data port	Connect to Receiver or scanner Data/Power cable
Aux	Auxiliary Data Port	Connect to GPS receiver or GPS/DR Navigation
Pwr In	Power Input connection	Connect to main power cable

E645xx Receiver
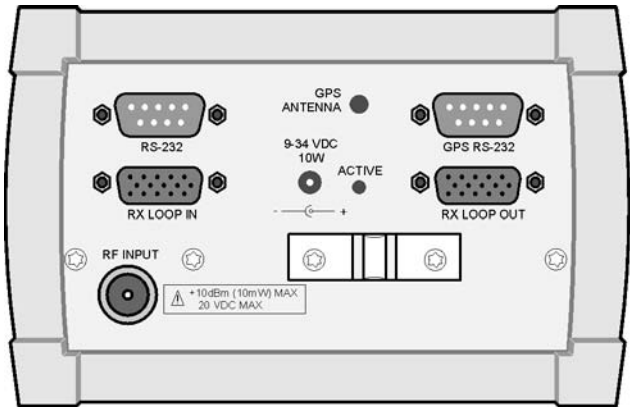
Figure 68 E645xx Receiver connector panel

Table 12 E645xx Receiver connector panel descriptions (see Figure 68)

Reference	Name	Description or Cable Connection
RS-232	Receiver data port	Connect to receiver data/power cable
GPS Antenna	GPS antenna connector	Connect to GPS antenna, if equipped (included with E6455C; and E6450B, E6452A, E6453A, and E6454A with GPS option)
GPS RS-232	External GPS data port	For CDMA receivers, an optional 1 PPS cable may be connected to this port, if the external navigator provides a 1 pulse per second signal. For E6455A, E6456A, and E645xC receivers, the cable for a wheel pulse trigger may be connected to this port.
Rx Loop In	Receive data loop input	Connect to Rx Loop Out of second receiver (if equipped)
Rx Loop Out	Receive data loop output	Connect to Rx Loop In of second receiver (if equipped)
9-34 VDC	Power input	Connect to Receiver Data/Power cable
Active	Active LED	Glows when unit is powered on
RF Input	RF antenna connector	Connect to receiver's RF antenna

E746xx Scanner
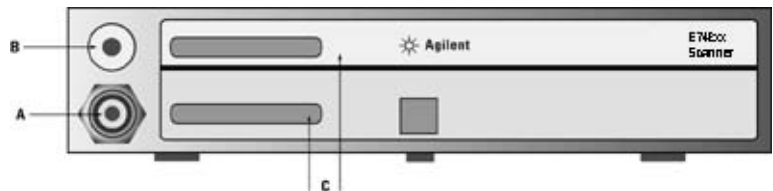
Figure 69   E746xx Scanner front panel

Table 13   E746xx Scanner front panel descriptions (see Figure 69)

Reference	Name	Description or Cable Connection
A	RF Antenna	Connect to antenna cable (for E7468A, match antenna with label)
B	GPS antenna connector	Connect to GPS antenna (E7462A, E7463A, E7464A only) Or Connect to second RF antenna (E7468A only)
C	Label	Indicates antenna to be connected
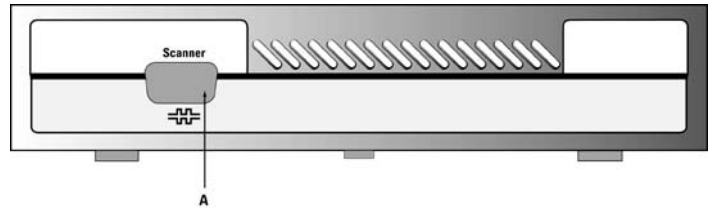
Figure 70   E746xx rear panel

Table 14   E746xx rear panel descriptions (see Figure 70)

Reference	Name	Description or Cable Connection
A	Scanner	Connect to the scanner data/power cable

Agilent High Speed Direct Connect GPS/DR Navigation

This navigator is Agilent part number E6473B Options 030 (Magnetic Mount Antenna) and 031 (Permanent Mount Antenna).
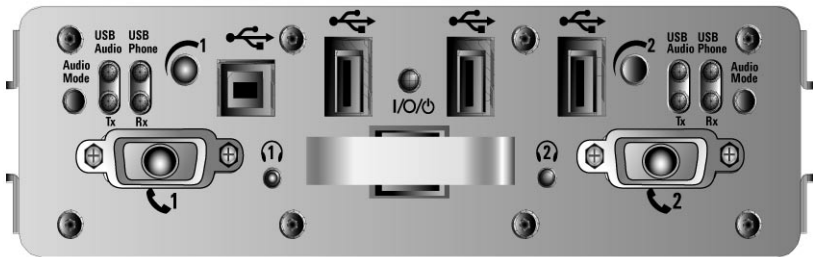
Figure 71   Agilent High Speed Direct Connect GPS/DR front panel

Table 15   Agilent High Speed Direct connect GPS/DR front panel descriptions (see Figure 71)

Reference	Name	Description or Cable Connection
I/O/⏻	Power switch	Left-most position powers the unit on manually. The middle position turns it off manually. The right-most position powers the unit on and off by the ignition switch)
⟷	USB Connector	The connector on the left is the USB Upstream port, which can connect to the PC. The connector on the right is the USB Downstream port, which can connect to another USB device.
Pwr / 1PPS	Power / 1 Pulse Per Second	The upper LED indicates that the power is on. The lower LED indicates one pulse per second from the GPS receiver.
Up ↑	GYRO Position	Allows unit to be positioned either vertically or horizontally without affecting dead reckoning. The user indicates the position by moving the Up pin to the appropriate position. Refer to "Gyro Positioning" on page 36.

Figure 72   Agilent High Speed Direct connect GPS/DR rear panel

Table 16   Agilent High Speed Direct Connect GPS/DR rear panel
descriptions (see Figure 72)

Reference	Name	Description or Cable Connection
RS232/1PPS	Serial Port and GPS 1PPS	Connects to the PC serial port for GPS data. Overrides the USB port on the front panel.
Pwr In	Power Input	Used to connects to power supply when the unit is in the rack.

Trimble Placer GPS 455DR

Figure 73   Trimble Placer connector panel

Table 17   Trimble Placer connector panel descriptions (see Figure 73)

Connector Name	Cable Part Number	Opposite End of Cable Connects To
GPS Antenna	E6450-80002	GPS antenna
Radio	8120-8650	GPS RS-232 port of the E645xx receiver or Serial port of the computer (this option requires a Dual Serial Port PCMCIA card)
MDT/RTCM		If you have a Differential GPS, connect its data cable to this port. This port is also used for sensor calibration. When calibrating, remove the cable from the Radio port, then connect it to the MDT/RTCM port. When calibration is complete, reconnect the cable to the **Radio** port.
Heading Sensor	Trimble p/n 30513	Heading Sensor lead: Connect to the heading sensor ODO 0 Red lead: Connect to the odometer pulse signal ODO 0 Black lead: Connect to ground.
Digital I/O	(none)	(not used)
Power	5182-1290	4-to-1 lighter socket adapter

C Connection Panels and LED Indicators

Agilent E6474A
User's Guide
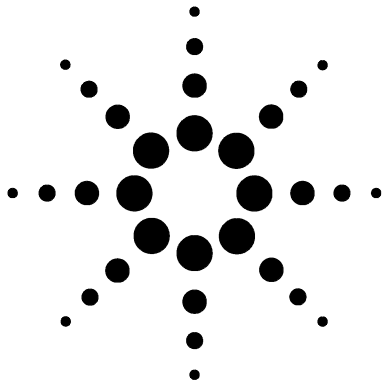
Appendix D
System Information

Overview

This appendix provides you with hardware specifications, options, and part numbers for the following.

For this	See this
Battery and charger specifications and battery disposal and power cable information	"Battery Specifications (part of E6473B, options 022, 023, and 024)" on page 181
Receiver specifications	"E6450C CDMA/TDMA PCS 1.9 GHz Receiver Specifications" on page 183 "E6451A/E6451C GSM900 Receiver Specifications" on page 185 "E6452C CDMA/TDMA Cellular Band Receiver Specifications" on page 187 "E6452A Option 002/E6457C Japan Cellular Band Receiver Specifications" on page 189 "E6453C GSM1800 and Korean CDMA Band Receiver Specifications" on page 191 "E6454C 1.9 GHz CDMA/GSM1900 Receiver Specifications" on page 193 "E6455C 2.1 GHz W-CDMA/UMTS/cdma2000 Receiver Specifications" on page 195 "E6456C 1.9 GHz W-CDMA/UMTS/cdma2000 Receiver Specifications" on page 197 "E6458C GSM 850 Receiver Specifications" on page 199 "E7456C iDEN/CDMA RF Receiver Specifications" on page 201
Cable part numbers	"Cable Part Numbers" on page 204

D System Information

For this	See this
Phone interface cable options	"E6473B phone interface cable options" on page 204
Antenna kit part numbers	"Antenna kit part numbers" on page 205
Agilent E645xx receivers	"Agilent Receivers" on page 206
Hardware included with the E6474A software licenses	"Hardware Included with E6474A Software Licenses" on page 206

Battery Specifications (part of E6473B, options 022, 023, and 024)

Item Description	Specifications
Part Number	E6473-60008
Typical Capacity	9000 mAh
Nominal Voltage	14.4V
Discharge Cut-off voltage	12.0V
Cell Configuration	five in parallel and four series
Allowable Temperature Range	-20º C to +60º C at discharge
	0º C to 40º C at charge
Storage Temperature Range	-20º C to 50º C 3-month
	-20º C to 35º C 6-month
	-20º C to 20º C 12-month
Humidity	0 to 85%
Weight	2.33 lbs. / 1.057 kg
Terminals	Discharge - Molex 15-24-6047
Charge - HCH No.IDJ-D22-6T	
Overcharge Protection	Charging turned off at and over 4.35 V/cell +\- .05 mV
	Charging re-enabled at and under 4.1 V/cell +/- 50 mV
	Charging off at nominal 4.2 V/cell with charge current <= 00 mA
Over Discharge Protection	Discharge off at and lower 2.35V / Cell Discharge re-enabled at and higher 3.05 V/Cell Shut Down at nominal 9.4V Wake at recharge
Short Circuit Protection:	Off at short circuit

Battery Disposal

When the battery is exhausted and/or ready for disposal, dispose of it according to your country's requirements. Within the US, you may contact Rechargeable Battery Recycling Corporation (RBRC) for disposal.

The RBRC seal on the nickel metal hydride battery pack indicates that Agilent Technologies is voluntarily participating in an industry program to collect and recycle these battery packs at the end of their useful life, when taken out of service within the United States. The RBRC program provides a convenient alternative to placing spent nickel metal hydride battery packs into the trash or municipal waste stream, which is illegal in some areas.

For information on recycling the battery outside the US, please check with your local Agilent sales office.

Power Cable

The battery pack charger is equipped with a three-wire power cable, in accordance with international safety standards. When connected to an appropriate power line outlet, this cable grounds the charger power supply case. Various power cables are available to connect the charger power supply to the types of AC power outlets unique to specific geographic areas.

Charger Specifications (part of E6473B Options 022, 023, and 024)

Item Description	Specification
Part Number	E6473-60009
Charger Input Voltage	100-230 VAC 1.5A 50-60 Hz
Charger Output Voltage	5-24 VDC 72W 5A max.

Receiver Specifications

This section contains detailed specifications on the Agilent receivers.

E6450C CDMA/TDMA PCS 1.9 GHz Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	1850 to 1910 MHz 1930 to 1990 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth (wideband mode)	1.25 MHz, characteristic
	IF bandwidth (narrowband mode)	30 kHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy 1.25 MHz IF	±0.5 typical (-25 dBm to -100dBm) ±1 dB from -40 dBm to -100 dBm (20° to 30°C) ±2 dB from – 40 dBm to – 100 dBm (0° to 55°C)
	Accuracy, 30 kHz IF	±0.5 typical (-25 dBm to -100dBm) ±1.5 dB from – 40 dBm to – 100 dBm (20° to 30°C) ± 2.5 dB from – 40 dBm to -100 dBm (0° to 55°C)
	Accuracy, 200 kHz IF	
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	– 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection Internally generated spurious, input referred	– 25 dBm typical 45 dB typical – 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male

D System Information

Item	Description	Specification
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	− 40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power Power (internal GPS option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	AC Power	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[‡] (Option 200)	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

* It is recommended the input signal level not exceed − 40 dBm.

† Adjacent channel desensitization applies to wideband mode (1.25 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.

‡ Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E6451A/E6451C GSM900 Receiver Specifications

Item	Description	Specification	
Frequency	Frequency range	E6451A range: 880 to 915 MHz 925 to 960 MHz	E6451C range: 876 to 915 MHz 921 to 960 MHz
	Frequency accuracy	±1 ppm	
	IF bandwidth	1.25 MHz, characteristic (wideband mode) 200 kHz, characteristic (narrowband mode)	
	Aging of TCXO	±1 ppm/year	
Amplitude	Accuracy, 1.25 MHz IF bandwidth	± 0.5 typical (-25 dBm to -100 dBm)	
	Accuracy, 200 kHz IF bandwidth	± 0.5 typical (-25 dBm to -100 dBm)	
	Noise figure	8 dB typical	
	Maximum safe input level	+10 dBm, 20V DC, characteristic	
	1 dB compression point [*]	−15 dBm, characteristic	
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	−25 dBm typical 45 dB typical −120 dBm	
Input/Output	RF input	50Ω Type-N	
Connectors	Computer	RS-232 (DB9) Male	
	GPS	RS-232 (DB9) Male	
	Power	DC power jack 100 mils, positive center	
Miscellaneous	Operating temperature range	0°C to 55°C	
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C	
	Storage temperature range	−40°C to +70°C	
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm	
	Weight	2.1 kg (4.6 lbs)	

Item	Description	Specification
	Power (options 300, 320, 340) Power (internal GPS, Option 310, 330, 350)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[**] **(Option 200)**	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning	

*   It is recommended the input signal level not exceed –25 dBm.

†   Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF Filter) and is defined as: 1 dB compression of tuned signal with interfering signal ±1.25 MHz from tuned signal.

‡   Adjacent channel rejection applies to the narrowband mode (200 kHz IF filter) and is defined as: Suppression of interfering signal ± 200 kHz from tuned signal.

**   Systems fitted with an internal GPS do not support connection to external GPS receivers.

E6452C CDMA/TDMA Cellular Band Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	824 to 849 MHz 869 to 894 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	1.25 MHz, characteristic 30 kHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 1.25 MHz IF	±0.5 typical ±1 dB from – 40 dBm to – 100 dBm (20° to 30°C) ±2 dB from – 40 dBm to – 100 dBm (0° to 55°C)
	Accuracy, 200 kHz IF	±0.5 typical ±1.5 dB from – 40 dBm to – 100 dBm (20° to 30°C) ±2.5 dB from – 40 dBm to – 100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	– 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	– 25 dBm typical 45 dB typical – 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C

D   System Information

Item	Description	Specification
	Storage temperature range	– 40°C to +70°C
	Dimensions	6 in × 3-5/8 in × 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power Power (internal GPS, option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[**] (Option 200)	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

[*]   It is recommended the input signal level not exceed – 40 dBm.

[†]   Adjacent channel desensitization: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.

[‡]   Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal for 30 kHz.

[**]   Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E6452A Option 002/E6457C Japan Cellular Band Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	832 to 870 MHz 887 to 925 MHz
	Frequency accuracy *With GPS time synchronization*	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	1.25 MHz, characteristic 30 kHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 1.25 MHz IF	±1 dB from − 40 dBm to − 100 dBm (20° to 30°C) ±2 dB from − 50 dBm to − 100 dBm (0° to 55°C) ±3 dB from − 40 dBm to − 50 dBm (0° to 55°C)
	Accuracy, 30 kHz IF	±1.5 dB from − 40 dBm to − 100 dBm (20° to 30°C) ±2.5 dB from − 40 dBm to − 100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	− 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	− 25 dBm typical 45 dB typical − 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	− 40°C to +70°C

D   System Information

Item	Description	Specification
	Dimensions	6 in × 3-5/8 in × 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power Power (internal GPS, option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[**] **(Option 200)**	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

*   It is recommended the input signal level not exceed – 40 dBm.

†   Adjacent channel desensitization: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.

‡   Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as: Suppression of interfering signal ± 30 kHz from tuned signal for 30 kHz.

** Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E6453C GSM1800 and Korean CDMA Band Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	1710 to 1785 MHz 1805 to 1880 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±.05 ppm characteristic
	IF bandwidth	1.25 MHz, characteristic (wideband mode) 200 kHz, characteristic (narrowband mode)
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 1.25 MHz IF bandwidth	±0.5 typical (-25 dBm to -100dBm)
	Accuracy, 200 kHz IF bandwidth	±0.5 typical (-25 dBm to -100 dBm)
	Noise figure	8 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	– 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection Internally generated spurious, input referred	– 25 dBm typical 45 dB typical – 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	– 40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm

Item	Description	Specification
	Weight	2.1 kg (4.6 lbs)
	Power Power (internal GPS, Option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[‡] **(Option 200)**	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

[*] It is recommended the input signal level not exceed – 25 dBm.

[†] Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF Filter) and is defined as: 1 dB compression of tuned signal with interfering signal ±1.25 MHz from tuned signal.

[‡] Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E6454C 1.9 GHz CDMA/GSM1900 Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	1850 to 1910 MHz 1930 to 1990 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±.05 ppm characteristic
	IF bandwidth	1.25 MHz, characteristic (wideband mode) 200 kHz, characteristic (narrowband mode)
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 1.25 MHz IF bandwidth	±0.5 typical (-25 dBm to -100dBm)
	Accuracy, 200 kHz IF bandwidth	±0.5 typical (-25 dBm to -100 dBm)
	Noise figure	8 dB typical
	Maximum safe input level	*+10 dBm, 20V DC, characteristic*
	1 dB compression point [*]	*– 15 dBm, characteristic*
	Adjacent channel desensitization [†] Adjacent channel rejection Internally generated spurious, input referred	– 25 dBm typical 45 dB typical – 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	– 40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	2.1 kg (4.6 lbs)

Item	Description	Specification
	Power	9 to 34 V DC, 9W
	Power (internal GPS, Option 200)	9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[‡] **(Option 200)**	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

*   It is recommended the input signal level not exceed – 25 dBm.

†   Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF Filter) and is defined as: 1 dB compression of tuned signal with interfering signal ±1.25 MHz from tuned signal.

‡   Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E6455C 2.1 GHz W-CDMA/UMTS/cdma2000 Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	1920 to 1980 MHz [1895-1990] 2110 to 2170 MHz [2100-2180]
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	1.25 MHz, characteristic 5 MHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy 1.25 MHz IF	± 0.5 dB typical from − 25 dBm to − 110 dBm (20° to 30°C)
	Accuracy, 5 MHz IF	±0.5 dB typical from − 25 dBm to − 100 dBm (20° to 30°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	− 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	− 20 dBm typical 25 dB typical − 120 dBm for 1.25 MHz -115 dBm for 5 MHz
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	− 40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm

D   System Information

Item	Description	Specification
	Weight	4.6 lbs (2.1 kg)
	Power	9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
	Support for Pulse triggering measurements	
Internal GPS	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: The internal GPS can be disabled if you wish to connect an external GPS system.	

*   It is recommended the input signal level not exceed – 40 dBm.

†   Adjacent channel desensitization applies to wideband mode (5 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 5 MHz from tuned signal.

‡   Adjacent channel rejection applies to the narrowband mode (1.25 MHz IF filter) and is defined as: Suppression of interfering signal ± 1.25 MHz from tuned signal.

E6456C 1.9 GHz W-CDMA/UMTS/cdma2000 Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	1850 to 1910 MHz 1930 to 1990 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	1.25 MHz, characteristic 5 MHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy 1.25 MHz IF	± 0.5 dB typical from – 25 dBm to – 110 dBm (20° to 30°C)
	Accuracy, 5 MHz IF	±0.5 dB typical from – 25 dBm to – 100 dBm (20° to 30°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	– 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	– 20 dBm typical 25 dB typical – 120 dBm for 1.25 MHz -115 dBm for 5 MHz
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	– 40°C to +70°C
	Dimensions	6 in x 3-5/8 in x 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)

Item	Description	Specification
	Power	9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
	Support for Pulse triggering measurements	
Internal GPS	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: The internal GPS can be disabled if you wish to connect an external GPS system.	

*   [1]It is recommended the input signal level not exceed – 40 dBm.

†   Adjacent channel desensitization applies to wideband mode (5 MHz IF filter) and is defined as: 1 dB compression of tuned signal with interfering signal 5 MHz from tuned signal.

‡   Adjacent channel rejection applies to the narrowband mode (1.25 MHz IF filter) and is defined as: Suppression of interfering signal ± 1.25 MHz from tuned signal.

E6458C GSM 850 Receiver Specifications

Item	Description	Specification
Frequency	Frequency range	824 to 849MHz 869to 894MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	1.25 MHz, characteristic 200 kHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 1.25 MHz IF	±0.5 typical ±1 dB from $-$ 40 dBm to $-$ 100 dBm (20° to 30°C) ±2 dB from $-$ 40 dBm to $-$ 100 dBm (0° to 55°C)
	Accuracy, 200 kHz IF	±0.5 typical ±1.5 dB from $-$ 40 dBm to $-$ 100 dBm (20° to 30°C) ±2.5 dB from $-$ 40 dBm to $-$ 100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	Maximum safe input level	+10 dBm, 20V DC, characteristic
	1 dB compression point [*]	$-$ 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	$-$ 25 dBm typical 45 dB typical $-$ 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C

D   System Information

Item	Description	Specification
	Storage temperature range	− 40°C to +70°C
	Dimensions	6 in × 3-5/8 in × 8 in 15.24 cm x 9.21 cm x 20.32 cm
	Weight	4.6 lbs (2.1 kg)
	Power Power (internal GPS, option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS[**] (Option 200)	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

*   It is recommended the input signal level not exceed − 40 dBm.

†   Adjacent channel desensitization: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.

‡   Adjacent channel rejection applies to the narrowband mode (200 kHz IF filter) and is defined as: Suppression of interfering signal ± 200 kHz from tuned signal for 200 kHz.

**   Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

E7456C iDEN/CDMA RF Receiver Specifications

Item	Description	Specification
Frequency	Forward Channel frequency range	851 to 870 MHz 935 to 940 MHz
	Frequency accuracy With GPS time synchronization	±1 ppm ±0.05 ppm, characteristic
	IF bandwidth	30 kHz, characteristic 1.25 MHz, characteristic
	Aging of TCXO	±1 ppm/year
Amplitude	Accuracy, 30 kHz IF	±1dB from -40 dBm to -100 dBm (20° to 30°C) ±2 dB from -50 dBm to – 100 dBm (0° to 55°C) ±3 dB from -40 dBm to – 100 dBm (0° to 55°C)
	Noise figure	8.0 dB typical
	1 dB compression point [*]	– 15 dBm, characteristic
	Adjacent channel desensitization [†] Adjacent channel rejection[‡] Internally generated spurious, input referred	– 25 dBm typical 45 dB typical – 120 dBm
Input/Output	RF input	50Ω Type-N
Connectors	Computer	RS-232 (DB9) Male
	GPS	RS-232 (DB9) Male
	Power	DC power jack 100 mils, positive center
Miscellaneous	Internal GPS receiver	8 channel
	Operating temperature range	0°C to 55°C
	Maximum relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C
	Storage temperature range	– 40°C to +70°C
	Dimensions	6 in × 3-5/8 in × 8 in 15.24 cm x 9.21 cm x 20.32 cm

D System Information

Item	Description	Specification
	Weight	4.6 lbs (2.1 kg)
	Power Power (internal GPS, option 200)	9 to 34 V DC, 9W 9 to 34 V DC, 10W
	Transformer AC Power (supplied with receiver)	100 - 240 Volts AC 50 - 60 Hz
Internal GPS [**] **(Option 200)**	GPS Receiver	8 Channel internal GPS receiver
	Connector type	SMA
	Differential compatible without dead reckoning **Note**: Internal GPS is standard on all "C" receivers. It can be disabled if you wish to use an external GPS system.	

* It is recommended the input signal level not exceed – 40 dBm.

† Adjacent channel desensitization: 1 dB compression of tuned signal with interfering signal 1.25 MHz from tuned signal.

‡ Adjacent channel rejection applies to the narrowband mode (200 kHz IF filter) and is defined as: Suppression of interfering signal ± 200 kHz from tuned signal for 200 kHz.

** Receivers (with the exception of "C" receivers) fitted with an internal GPS do not support connection to external GPS receivers.

Phone Support

Please contact your Agilent representative for the most current list of phones supported by the Agilent 6474A.

Options and Part Numbers

Cable Part Numbers

Part Number	Description
E6473-60206	Direct Connect Hub power cable, permanent mount
E6473-60004	Direct Connect Hub power cable with lighter plug
E6473-60005	Direct Connect Hub to computer USB data cable, 3 feet (.914 m)
E6473-60006	Direct Connect Hub to E645xx Receiver data/power cable
E6473-60010	Direct Connect Hub to computer USB data cable, 15 feet (4.57 m)
E6473-60011	4-to-1 lighter socket adapter for Direct Connect Hub, GPS receiver, phone
E6473-60015	9 to 26 pin converter - adapts standard phone cable to computer Serial port
E6473-60042	Phone extender cable, 15 feet (4.57 m)

E6473B phone interface cable options

Option	Description
E6473B #801	Qualcomm QCP 820/1920/2700 CDMA IS-95 Phone Interface Cable
E6473B #802	Qualcomm QCP860/1960/270 CDMA IS-95 Phone Interface Cable w/o external RF Connection
E6473B #805	Kyocera Voice-Only/2K Phones Int. Cable (Kyocera 2235/2255/2325/2345/5742
E6473B #810	Kyocera 2255 data and trace cable with RF
E6473B #811	Kyocera 2235 data and trace cable with RF

E6473B #812	Kyocera 2235/2255/2325/2345 data and trace cable with no RF
E6473B #825	OT-96M/OT 190/OT 199 Voice & data cable, no RF
E6473B #827	Sagem OT-76M/OT-96M/OT-160/OT-169 voice only phone cable with no RF
E6473B #830	TDMA Nokia 6120/6160 Phone Interface Cable
E6473B #840	Sanyo SCP-4500 CDMA phone interface cable with no RF
E6473B #850	GAIT Nokia 6340 phone interface cable with no RF
E6473B #861	iDEN Motorola i1000+/i2000+ phone interface cable with no RF
E6473B #865	iDEN Motorola i85s and i90 voice cable, no RF
E6473B #871	SCH-X120/SPH-X1200 phone interface cable with no RF

Antenna kit part numbers

These kits include an antenna clip.

Part Number	Description
E7484-60029	800 MHz for CDMA, iDEN
E7484-60027	1800 MHz GSM
E7484-60028	1900 MHz for CDMA, GSM
E7484-60026	900 MHz GSM

Agilent Receivers

Part Number	Description	Available Options
E6450C	PCS CDMA/TDMA receiver, 1.9GHz	
E6451C	GSM receiver, 900 MHz	
E6452C	Cellular CDMA/TDMA receiver, 850 MHz	
E6457C	Cellular CDMA/TDMA receiver, 800 MHz, Japan cellular band	
E6453C	GSM/Korean band CDMA receiver, 1.8GHz	
E6454C	PCS CDMA/GSM receiver, 1.9GHz	
E6455C	IMT-2000 band W-CDMA (UMTS) / CDMA receiver, 2.1 GHz (with GPS)	
E6456C	W-CDMA/UMTS/cdma2000, 1.9 GHz (with GPS)	
E6458C	GSM850 Receiver (with GPS)	

Hardware Included with E6474A Software Licenses

E6473B hardware options are typically ordered with E6474A Network Optimization Solution Software. E6474A Software option licenses include the following hardware items:

Component	Part Number	Description
Software license key for Parallel port	E6474-10002	Contains the E6474A software options that you have ordered. Plugs into the computer's Parallel port.
Software license key for USB port	E6474-10003	Can be programmed with the E6474A or E74xx software options that you have ordered using the License Manager software. Plugs into the computer's USB port.
Dual serial port PCMCIA card	1150-2067	Plugs into the computer's PCMCIA card slot. Used if a device is connected directly to the computer.

Agilent E6474A
User's Guide
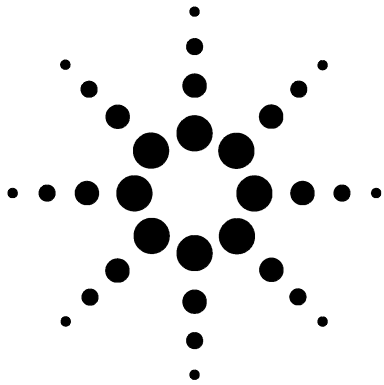
Appendix E
Permanent In-Vehicle Hardware Installation

WARNING **Before installing this product, check your vehicle warranty for any special instructions regarding the installation of third party products. Agilent assumes no responsibility for any vehicle warranty issues arising out of the installation or use of this product.**

To install this	See this
Direct connect hub	"Direct Connect Hub Installation" on page 210
Antenna	"Antenna Installation" on page 212
Computer mount	"Computer Mount Installation" on page 213
Cables	"Cable Installation" on page 214

Installation Guidelines

Use the following guidelines for installing the system hardware.

- The dimensions of the in-vehicle rack with the navigator installed are approximately:
  - Width: 11 inches / 280 mm
  - Depth: 10.5 inches / 265 mm (allow an additional 3 inches / 76 mm for handles)
  - Height (with E746xx): 6.5 inches / 164 mm
- Because every installation has different requirements, the installer must select the appropriate mounting hardware.
- If you are using a permanently installed cellular antenna, follow the antenna manufacturer's installation instructions. Antennas should be spaced at least 18" apart to avoid interference.

WARNING **Choose suitable locations for the navigator and E6473B, the phones, the speakers, and the computer, that will not interfere with the operation of the vehicle, but will allow access to the cable connectors. If the system includes an E645xx receiver, allow room for its mounting plate.**

Observe local regulations and restrictions when installing the equipment and making electrical connections to the vehicle.

Use caution when drilling holes and working around critical areas, such as the fuel tank, fuel lines, battery, engine compartment, electrical harnesses, fuse block, and the exhaust system.

Disconnect the battery before making permanent connections to the electrical system.

CAUTION	Secure all components to prevent movement while the vehicle is in motion.
	When routing cables leave sufficient length on both ends for making connections. Avoid sharp metal edges, sharp bends, and crushing the cables. Use a rubber grommet if the cable is routed through a hole in a metal panel. Do not route a cable near the catalytic converter. Use wiring troughs when they are available.

Recommended Tools

- Electric drill and bits
- Screwdriver
- Phillips screwdriver
- Wire cutter and stripper
- Voltmeter

- Terminal crimping tool or equivalent
- Pliers
- Utility knife
- Panel removing tool (optional)
- For in-vehicle rack installation, either a nut driver, electric screwdriver, or drill with screwdriver bits

Direct Connect Hub Installation

Follow the instructions in this section to install the Agilent E6473B High Speed Direct Connect Hub. If you system includes the Agilent direct connect GPS DR, go to "Communicating with the Agilent Direct Connect GPS/DR" on page 45.

In-Vehicle Rack Installation

1 Place the in-vehicle rack in the desired location.

2 Using an appropriate-sized nut driver, electric screwdriver, or drill with screwdriver bit, drive in each of the four #10 self-drilling tapping screws.

Self-drilling
tapping screw
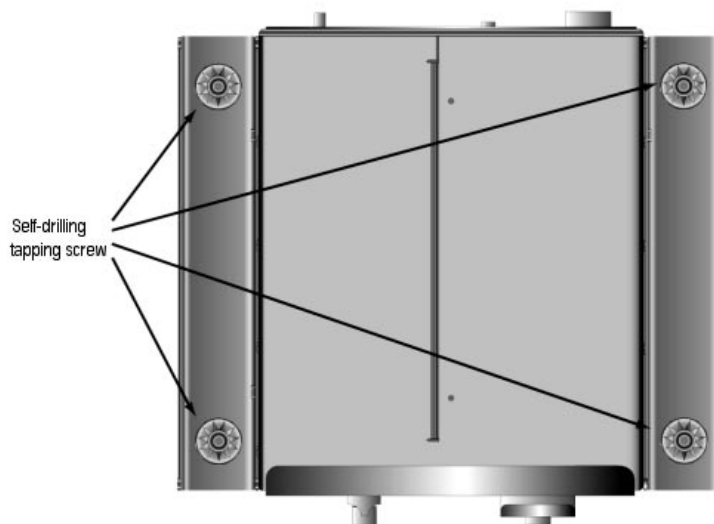
Figure 74   In-Vehicle Rack for Direct Connect Hub

Mounting the E645xx Receiver

If equipped, install the receiver's mounting plate as follows:

1 Locate a flat surface of the vehicle to which the base plate can be securely attached.

2 Mark the holes for the #10 mounting screws on the mounting surface according to the hole pattern of the plate.

3 Drill the holes, using a 3/32" drill bit, or the metric equivalent that accommodates the screw.

4 Attach the base plate to the vehicle, using the hardware provided.

Attach the receiver(s) to the plate with the straps provided.
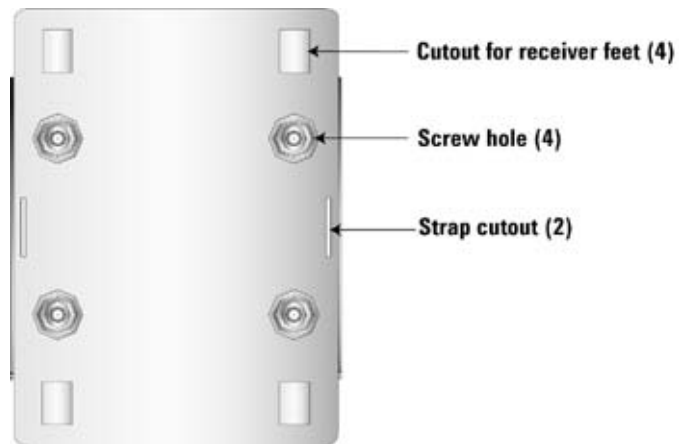
Figure 75   E645xx receiver mounting plate

Antenna Installation

Installation Guidelines

- All antennas must be spaced at least 18 inches (45.7 cm) apart. Plan the layout before drilling any holes.

- A magnetic-mount antenna may be mounted on any suitable metallic surface, paying attention to the routing of the cable. However, avoid areas of high vibration, such as the engine hood. Also avoid mounting the antenna near a roof luggage rack. (The rack could block the signal.)

- For permanent-mount antennas, choose a location with access both above and below the antenna-mounting surface; this is required for installing fasteners and for routing the antenna cable.

- For permanent-mount antennas, use silicone sealant to prevent water leakage between the antenna base and the mounting surface.

- The GPS antenna must be located outside of the vehicle with a clear view of the sky.

- Choose a horizontal mounting position for the GPS antenna.

GPS Antenna

You can choose between a magnetic-mount GPS antenna (E6473B option 30) or a permanent mount antenna (E6473B option 31) with the Agilent direct connect GPS/DR.

1 Choose a position for the antenna that is at least 18 inches (45.7 cm) away from any other antenna.

2 Route the antenna cable through the vehicle to the navigator or PN scanner.

3 Secure the permanent-mount antenna to the surface with the TNC connector of the antenna cable.

Cellular Antennas

Your system may include magnetic-mount or permanent mount antennas, depending on the order.

1 Identify the antennas.

2 Install permanent-mount antennas according to the antenna manufacturer's instructions.

3 Route the antenna cables through the vehicle to the area where the system is installed.

4 If equipped, attach the antenna adapters to the antenna cable, then connect the adapter to the phone. See Table XX, Adapters Used in Kits, on page XX for adapter part numbers.

Computer Mount Installation

If your system includes a computer mounting kit, follow the installation instructions packaged with it. Refer to the computer manufacturer's documentation to identify the computer connectors.

1 Install the computer mounting kit.

2 Attach the computer to the mounting bracket.

3 Connect the USB data cable to the USB port of the computer.

4 Connect the power cable to the computer.

5 Connect the opposite end of the power cable to the lighter socket.

Cable Installation

Phone Extender Cables

Route the extender cables (E6473-60042) from the vehicle interior to the location where the Direct Connect Hub is installed, then follow the phone cable connection instructions in Chapter 3.

USB Data Cable

Route the USB data cable (E6473-60010) from the vehicle interior to the location where the Direct Connect Hub is installed, then follow the USB cable connection instructions in Chapter 3. If your system includes two Direct Connect Hub units, see Chapter 3.

Main Power Cable

A permanent install cable (E6473-60206) is included. The following installation instructions are for the permanent install power cable.

WARNING	It is recommended that you disconnect the vehicle's battery before making any connections to the vehicle power.

Two different non-removable input power cables may be included, depending on the options ordered:

- E6473B-010 includes the permanent install power cable (E6473-60206) for the Direct Connect Hub.

    The leads for this cable are color-coded as follows:

    - The red lead is power (+)
    - The black lead is ground (-)
    - The white lead is ignition sense.

Power Cable Connections to the Vehicle

1 Attach the ring terminal of the black lead to chassis ground using the appropriate hardware. Ensure that a good mechanical and electrical connection has been made to the chassis, then coat the connection with anti-corrosive spray.

2 Connect the red lead to the battery positive (+) terminal.

3 Connect the ignition sense lead as described under "Ignition Sense Lead" on page 216.

4 When installation is complete, secure any loose wires with wire ties.

5 Route the cable through the vehicle to where the E6473B is installed.

Ignition
sense cable
connections
to the vehicle
wiring
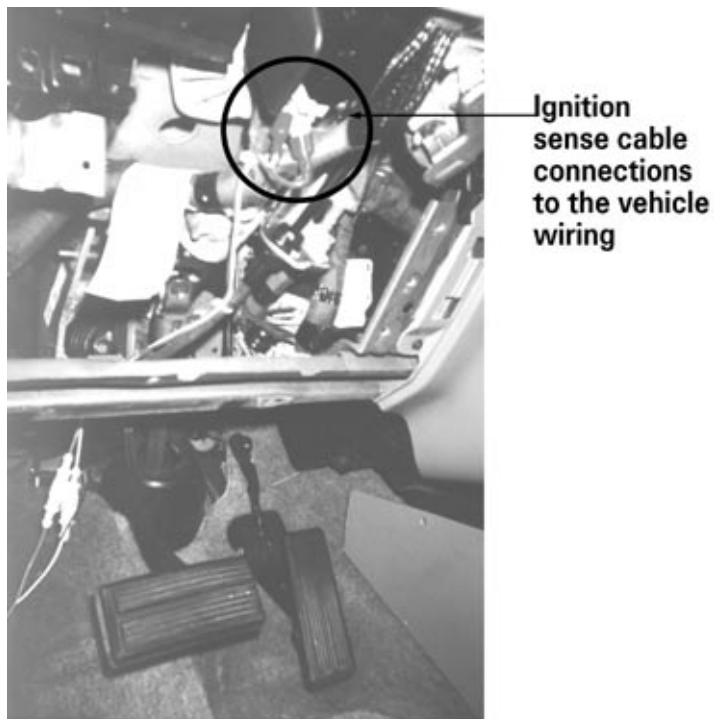
Figure 76   Ignition Sense lead connected to the vehicle

Ignition Sense Lead

Connect the ignition sense lead of the power cable to a source that measures +12 volts only when the ignition switch is on, using one of the following methods:

• Connect it to the radio side of the radio fuse.

• Connect it to a 12 volt power lead that is switched on and off by the ignition switch.

NOTE   Direct Connect Hub: If you do not connect the Ignition Sense lead of the power cable for the Direct Connect Hub, the unit can only be powered on and off via its front panel switch.

The ignition sense wire color code is specified under "Main Power Cable" on page 214.

Connecting the Ignition Sense Lead to the Fuse Block

Because each vehicle is different, the installer must determine the best method for attaching the lead to the fuse block. We recommend that you crimp a quick-disconnect terminal onto the lead, then plug the terminal into the fuse block.

Connecting the Ignition Sense Lead to a Switched 12 Volt Lead

Locating the 12 Volt Power Leads

1 Remove the steering column panel or the lower dashboard panel. (See Figure 76 on page 216.)

2 Locate the two 12 or 10 AWG wires under or near the steering column.

3 Using a voltmeter, identify the lead that always measures 12 volts.

4 Using a voltmeter, identify the lead that measures 12 volts when the ignition is switched on.

Connecting the Ignition Sense Lead to the Vehicle Wiring

1 Cut approx. 12" (30.4 cm) off of the ignition sense lead of the cable assembly.

2 Crimp an inline fuse holder onto the 12" (30.4 m) lead.

3 Crimp the other side of the inline fuse holder onto the ignition sense lead of the cable assembly.

4 Connect the free end of the 12" (30.4 cm) lead to the switched 12 volt lead using a wire tap.

Speed Pulse Cable

This cable is only included if you have ordered the Agilent direct connect GPS DR with mag mount antenna (E6473B option 030) or with permanent mount antenna (E6473B option 031). The GPS DR requires the Speed Pulse cable (E6473-60207), which is connected to the vehicle's digital odometer or speed pulse lead.

<div style="border:1px solid #000;">

NOTE The odometer pulse lead typically originates from the computer module (PCM) in the engine compartment. Contact Agilent Customer Support for assistance in locating the correct lead in your vehicle.

For vehicles not equipped with a digital speed pulse signal, an analog speedometer pickup utilizing a Hunter Universal Transducer is available. Contact Customer Support for details.

</div>

General Installation

1 Locate the emergency brake cable grommet, at the point where the cable passes through the firewall.

2 Cut a slot in the grommet to allow the Speed Pulse cable to pass through it.

3 Feed the cable through the grommet into the engine compartment.

4 Connect the black lead with the ring terminal to the vehicle chassis.

5 Connect the black terminal to the speed pulse ground lead using a wire tap.

6 Connect the red terminal to the speed pulse lead using a wire tap.

7 Connect the white terminal to the positive lead of the backup light using a wire tap.

8 Route the cable through the vehicle to where the navigator is installed.

Installation for 2001 (and Later) Ford Windstar

NOTE

A Pulse Frequency Divider must be used with the 2001 (and later) Ford Windstar. This device is part # AA-1600-05-01TO12, and is available from:
Arthur Allen Mfg. Co., Inc.
235 E O'Connor Drive
Elkhorn, Wisconsin 53121

Phone: 262-723-1760
Toll Free: 800-683-0500

Cable Routing

1 Locate the emergency brake cable grommet, at the point where the cable passes through the firewall.
2 Cut a slot in the grommet to allow the Speed Pulse cable to pass through it.
3 Feed the cable through the grommet into the engine compartment.

Engine Compartment Connections

NOTE

The wire harness above the engine contains the speed pulse wires.

1 Unwrap the split loom of the wire harness to reveal the wires.
2 Connect the red terminal of the speed pulse cable to the Dark Blue w/ Yellow wire. This is the positive connection.
3 Connect the black terminal of the speed pulse cable to the Black w/ White wire. This is the negative connection.

Interior Connections

1 Remove approximately 2" (5 cm) of the outer jacket of the speed pulse cable, where the cable comes through the firewall (under the dashboard).

2 Cut the red and the white wires at the midpoint of the jacket opening.

3 Solder the red and white wires of the cable section routed from the engine compartment to the green wire of the frequency divider, then cover the connection with shrink tubing. Figure 77 shows connections to the frequency divider.

4 Solder the red and white wires of the cable section routed to the navigator to the yellow wire of the frequency divider, then cover the connection with shrink tubing.

5 Connect the red lead of the frequency divider to an ignition-switched +12 VDC source, such as the radio fuse. Use appropriate connectors.

6 Connect the black lead of the frequency divider to chassis ground. Use appropriate connectors.

7 Secure the frequency divider to a flat surface using Velcro or an equivalent method.

8 Secure the speed pulse cable under the dashboard using wire ties.
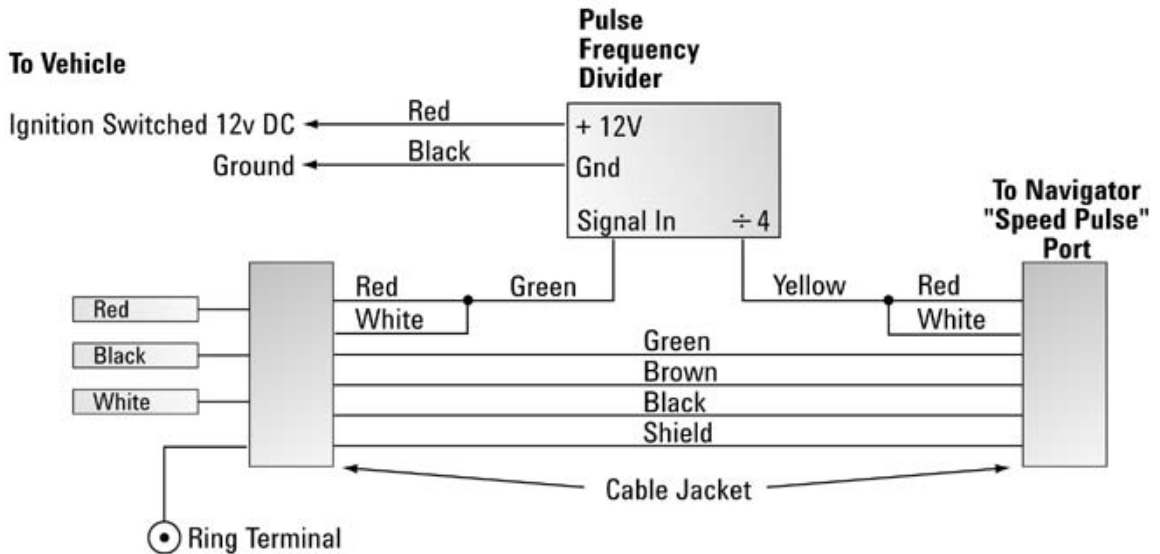
Figure 77   Cutaway section of the speed pulse cable, showing connections to the Pulse Frequency Divider

Navigator Connections

- Route the cable through the vehicle to where the navigator is installed.

E Permanent In-Vehicle Hardware Installation

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